THE FOUNDRY

A TRADE JOURNAL

DEVOTED TO THE INTERESTS OF THE WHOLE FOUNDRY BUSINESS

MARCH, 1896.

Vol. VII. No. 43.

Contents

MAKING A LARGE KETTLE IN LOAM —Illust 263
MANIPULATION & DETERIORATION OF CAST IRON—H J GRAF 265
THE MOBILITY OF MOLECULES OF CAST IRON—A. E. OUTERBRIDGE, JR. 267
CORE BOX MACHINE—Illust 272
EDITORIAL 278
The Trade—Meeting of Foundrymen in Philadelphia—Krank's Korner—The Scrap Heap.
GIRLS IN A FOUNDRY—Illust 278
CAST IRON NOTES—W. J KEEP 278
A COMBINED HOIST AND DERRICK—Illust 281
OBITUARY 282
NEW FOUNDRY ENTERPRISES 283
PNEUMATIC SAND SIFTER—Illust 286
QUESTIONS AND ANSWERS 287
JAMES CHALMERS (Cont'd.)—W. EDWARD 287
TELEGRAPHIC CIPHER CODE 289
THE FOUNDRY FOREMAN 289
WESTERN FOUNDRYMEN'S ASSOCIATION 290
PITTSBURG AND VICINITY 291
MANUFACTURE OF ALUMINUM, BRASS AND BRONZE 292
CHIMMIE POWERS IN ST. LOUIS 294
PHILADELPHIA FOUNDRYMEN'S ASSOCIATION 294

Published Monthly by THE FOUNDRY PUBLISHING CO.

DETROIT, MICH.

A FACING and Blacking to be satisfactory for all kinds and weights of castings, that can be shaken on the mold and be slicked nicely, or when mixed with water will make a good core wash, that can be used for dry sand or loam work, stand the heat and weight of molten metal whether poured hot, slow or fast, and not burn off, wash or run and will peel clean from the casting, is a Facing and Blacking that we think should interest every foundryman and molder living.

Just such a Facing and Blacking is RADIANT, and furthermore, we guarantee it to be so and will take it back and refund the price if it is not. WHAT MORE CAN WE OFFER? Radiant Facing is sold entirely on its merits and nothing else whatever has had anything to do with the extraordinary success of this Facing and Blacking. We have had some foundrymen tell us that it is undoubtedly the best general Facing and Blacking they ever used, but that they thought the price was too high. Is 2¼ cents per pound too high for the best Facing and Blacking on earth? We have noticed that these same people will buy Plumbago or Silver Lead at twice and more the price and never complain. Plumbago or Silver Lead are all right. We sell them, and would like to sell a good deal more of them; but there are objections to their use in the foundry doing general work that are overcome by the use of Radiant Facing and Blacking. How many complaints we hear about the hardening of

the surface of castings? There is nothing that will harden the surface of the casting sooner or more effectually than Plumbago or Silver Lead. We grant that Plumbago or Silver Lead makes a beautiful mold and a pretty (?) bright looking casting; but the question is whether this color or a casting is more satisfactory than a dark blue steel color such as the Radiant Facing and Blacking gives it? Radiant Facing and Blacking will not harden the surface of the casting. It can be shaken on the mold, through a bag, on parts that cannot be reached with a tool to slick it, and the facing will stick and peel clean.

The whole matter is that Radiant Facing and Blacking is the very best, most economical and satisfactory Facing and Blacking for the general jobbing foundry. There is no question about this and if you have any doubts about it, send for a barrel subject to approval. Our guarantee is that it will do everything we have stated above, otherwise you need not keep it and we will pay the freight.

The J. D. Smith Foundry Supply Co.

Manufacturers of Foundry Facings, Blackings,
Foundry Supplies, and Refiners of Plumbago.

Cincinnati, Ohio, U. S. A.

IT'S YOUR DESIRE

to make nice, bright, smooth Castings at a nominal cost,

AND IT'S OUR DESIRE

to assist you in accomplishing it. Grant us this privilege and it will pay you and be a satisfaction to us.

We are making a specialty of the finest grades of **East India Plumbago** and **India Silver Lead** and invite correspondence on the subject.

Trial sample free.

THE S. OBERMAYER CO.

CINCINNATI, O. CHICAGO, ILLS.
LARIMER, PA.

Also manufacturers of "THE BEST" Facings, Blackings and Foundry Supplies in general.

ESTABLISHED 1855. J. W. PAXSON J. K. BOUGHER
HOWARD EVANS H. M. BOUGHER

This may give you an Idea!

HOW really few people there are after all who appreciate the extent of the foundry business in this country or the multiplicity of interests involved therein. Take for instance the subject of Foundry Supplies and Equipments, of which we are the acknowledged largest dealers on the face of the earth. In order to fill the requirements of our trade, we operate steadily all the year round (night and day most of the time) the following mills on different work as follows:

Quaker City Mills, Phila, Pa.—XX Colombo Plumbago, East India Plumbago, Silver Lead, IXL Lead, XX Mineral, Premium Return, Banner Fire Proof, German Lead, Mineral Lead.

Lehigh Mills, Lehighton, Pa.—Pipe Blacking, Car Wheel Mineral Facing, Mineral Facing, Core Wash Facing.

Sea Coal Mills, Irwin, Westmoreland Co., Pa.—Sea Coal Facing, Bituminous Facing, Carbon Facing, Coke Facing, Charcoal Facing.

Annex Mills, Phila, Pa.—Anthracite Facing, Lehigh Facing, Charcoal Facing, Talc Facing, Soapstone Facing, Core Compound.

Welsh Mountain Mills and Quarry, Honey Brook, Pa.—Ground Silica Rock, Ground Ganister, Silica Clay, Kaolin, Steel Mould Wash, Furnace Bottom Sand.

In the matter of Foundry Equipments we Fill Orders Promptly for such things as

Cupolas, Cupola Lining, Blowers, Ladles, Core Ovens, Iron Flasks, Snap Flasks, Rumblers, Brass, Furnaces, etc.

Our line of Sands is the Largest and Most Complete to be found and consists of any grade of

Moulding Sand, Core Sand, Steel Sand, Clay, Gravel, Fire Sand, Mica Sand, Fire Stone etc.

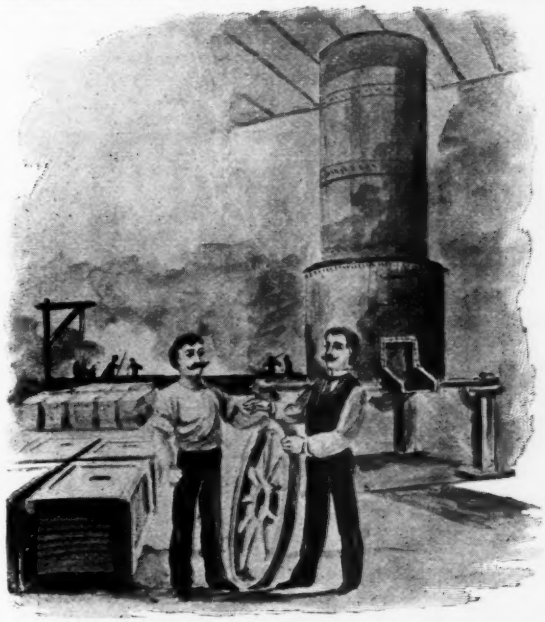
In addition to all these, our large Foundry Supply Factory is kept running full handed making

Riddles, Sand Sifters, Casting Brushes, Bristle Brushes, Metallic Letters, Moulders' Tools, Bellows, Wire Brooms, Flue Brushes, etc.

As we make all we sell, we guarantee every article.

J. W. PAXSON & CO.,

PHILADELPHIA, PA.



"John, I want six off this to-day and must have first-class castings. Be sure and use only **KELLY'S PLUMBAGO**, as they have got to be nice."

T. P. KELLY & CO.

MANUFACTURERS OF

Plumbago, Foundry Facings, and Blackings.

DEALERS IN

FOUNDRY SUPPLIES

We are the largest grinders of PLUMBAGO for FOUNDRY purposes in the United States. Our "B. M." brand of PLUMBAGO will assimilate with any SAND.

It is thoroughly purified, being chemically free of

ALUMINA, SILICA, MICA

AND OTHER IMPURITIES.

We GUARANTEE SMOOTH CASTINGS and satisfactory results wherever it is used.

MILLS AT
BLOOMSBURY, N. J.
AND
REISSING, PENN.

CHICAGO OFFICE:
121-127 NORTH ADA ST.
NEW YORK OFFICE:
284 PEARL ST.

McQUIOUGH DAIZELL COMPANY
MANUFACTURERS OF
CRUCIBLES · STOPPERS
AND ALL ARTICLES
CONTAINING
PLUMBAGO
PITTSBURG, PA.
U.S.A.

P. G. COCHRAN, Pres. JOHN H. WURTZ, Secretary
J. R. LAUGHREY, Treas. J. S. NEWMYER, Mgr.

Washington Coal & Coke Co

(CAPITAL PAID-UP $250,000.)

MANUFACTURERS OF

HIGH GRADE COKE

We Make a specialty of 72 Hour
Foundry Coke.

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Room 8, Conestoga Building, 7 Wood St.

General Office, DAWSON, PA. PITTSBURG, PA.

Crucible.

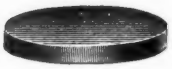
Crucible

Dipper.

Jewelers'.

Stirrers.

Cover.


Cover.

Stopper.

Crucibles

For melting STEEL, BRASS, COPPER, GOLD AND ALL OTHER METALS. We are the only PRACTICAL MEN in our business and we work strictly by CHEMICAL ANALYSIS; our CRUCIBLES will be found UNIFORM and RELIABLE at all times; they are well known all over this country and also Europe; send us a trial order and we will secure you as a customer. Also FINE GRAPHITE for LUBRICATING PURPOSES, for the devolopement of High Speed and Great Power. Our GRAPHITE is the purest in the market as Analysis will prove.

ROBT. J. TAYLOR & SON,

1900 to 1916
CALLOW HILL STREET, PHILADELPHIA, PA.

CHAS. M. JARVIS, President and Chief Engineer. BURR K. FIELD, Vice-President.
GEO. H. SAGE, Secretary F. L. WILCOX, Treasurer.

THE BERLIN IRON BRIDGE CO.,

ENGINEERS, ARCHITECTS

—AND BUILDERS OF—

Iron and Steel Bridges, Roofs and Buildings.

The following is a list of some of the parties for whom we have furnished Foundry Buildings for casting both in Iron and Brass:

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Malleable Iron Fittings Co., Branford, Conn.
Bagley & Sewall, Watertown, N. Y.
Ansonia Brass & Copper Co., Ansonia, Conn.
Lake Erie Engineer Co., Buffalo, N. Y.
Waterbury Brass Co., Waterbury, Conn.
Brooks Locomotive Works, Dunkirk, N. Y.
Newport News Foundry Co., Hampton, Va.
The Standard Harrow Co., Utica, N. Y.
Munson Bros., Utica, N. Y.
Wm. Cramp & Sons' Ship & Engine Building Co., Philadelphia, Pa.
Turner & Seymour Mfg. Co., Torrington, Conn.
Union Metallic Cartridge Co., Bridgeport, Conn.
Randolph & Clowes, Waterbury, Conn.
Holmes, Booth & Haydens, Waterbury, Conn.
Waterbury Farrel Foundry & Machine Co., Waterbury, Ct.
Samuel F. Hodge & Co., Detroit, Mich.
National Transit Co., Oil City, Pa.
Farrel Foundry & Machine Co. Ansonia, Conn.
Naugatuck Malleable Iron Co., Naugatuck, Conn.
Jackson & Woodin Mfg, Co., Berwick, Pa.
The Batopilas Mining Co., Chihuahua, Mexico.
Daniel E. Paris Stove Co., Sioux City, Iowa.
Watts-Campbell Co., Newark, N. J.
Pratt & Cady Co. Hartford, Conn.
New Haven Copper Co., Seymour, Conn.
Brooklyn Brass & Copper Co., Brooklyn, N. Y.
Coe Brass Co., Torrington, Conn.

Office and Works, - - EAST BERLIN, CONN.

SEND FOR ILLUSTRATED CATALOGUE.

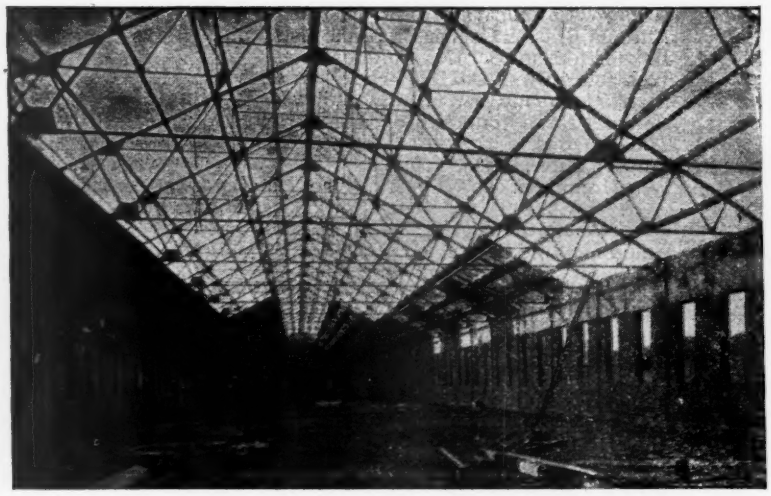
Wrought Iron Bridge Co.,

DESIGNERS AND BUILDERS IN
IRON AND STEEL
FIRE PROOF BUILDINGS

FOUNDRIES, MACHINE SHOPS
— FOR —
ETC., ETC.

Exterior of Foundry of Warder, Bushnell & Glessner Co., Springfield, Ohio.

Traveling and Jib Cranes for handling
Heavy Castings and Machinery.



Buildings Designed for Special
Requirements.

Interior Foundry Building of Warder, Bushnell & Glessner Co., Springfield, Ohio.

The roof of this building was erected by the Wrought Iron Bridge Co., Canton, Ohio, and consists of steel trusses supporting wooden purlins to which matched and dressed sheeting is nailed for slating. Trusses being 18 ft. above the floor, the wood work of roof is out of danger from fire, while the cover being of slate a suitable cornice to protect the overhanging of roof from flying sparks, or heat from the burning of neighboring buildings, renders this structure absolutely fire proof. Windows are set in the sides of ventilator throughout its entire length, so that ample light and ventilation is insured.

Wrought Iron Bridge Co.

ADDRESS NEAREST OFFICE.

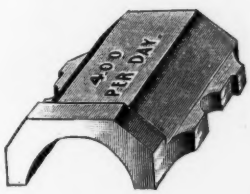
CANTON, O. KANSAS CITY, MO. CHICAGO, ILL.

136 Liberty St., NEW YORK.

ONE MAN'S WORK

—WITH THE—

TABOR AUTOMATIC MOLDING MACHINE



POURS CASTINGS TRUE TO PATTERN

MOLDS DO NOT BLOW

DUPLEX MACHINE.

Molds both parts of flask at one operation of machine, thus making two machines in one.

These machines are adapted to general castings when made in reasonable quantities.

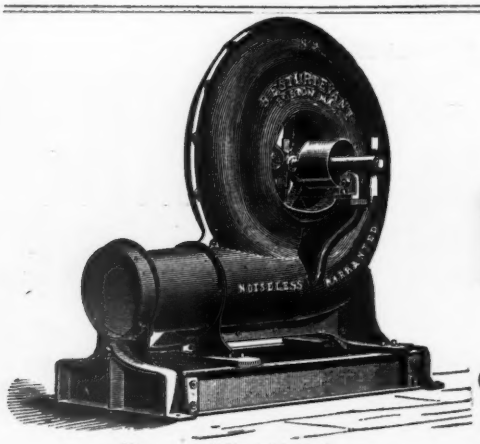
The use of these machines is a guarantee of economy, greater quantity and better quality in castings.

Foundrymen who are interested in producing cheap castings of superior quality are invited to correspond with the Company and call at the works, Front and Franklin Streets, Elizabeth N. J., and see the machines in operation.

The Tabor Manufacturing Co.

39 Cortlandt Street,

NEW YORK, - - - N. Y.



Blower on Adjustable Bed.

THE STURTEVANT STEEL Pressure Blowers,

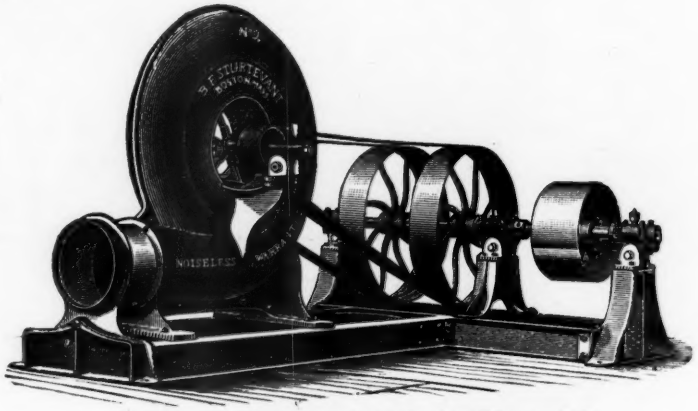
—FOR—

Cupola Furnaces and Forge Fires.

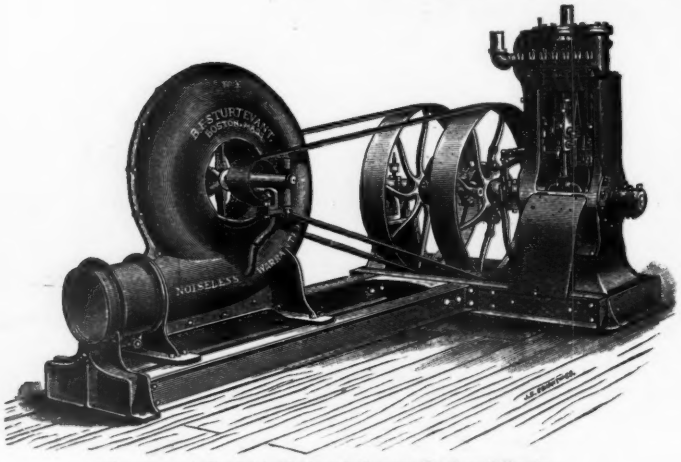
BLOWERS

Furnished without Bed with Separate Countershaft

BLAST GATES



Blower on Adjustable Bed with Combined Countershaft.



Blower on Adjustable Bed with Double Enclosed Engine.

BLOWERS

WITH

THE STURTEVANT

Direct Connected

Electric Motors

Send for Catalogue.

B. F. STURTEVANT CO.,

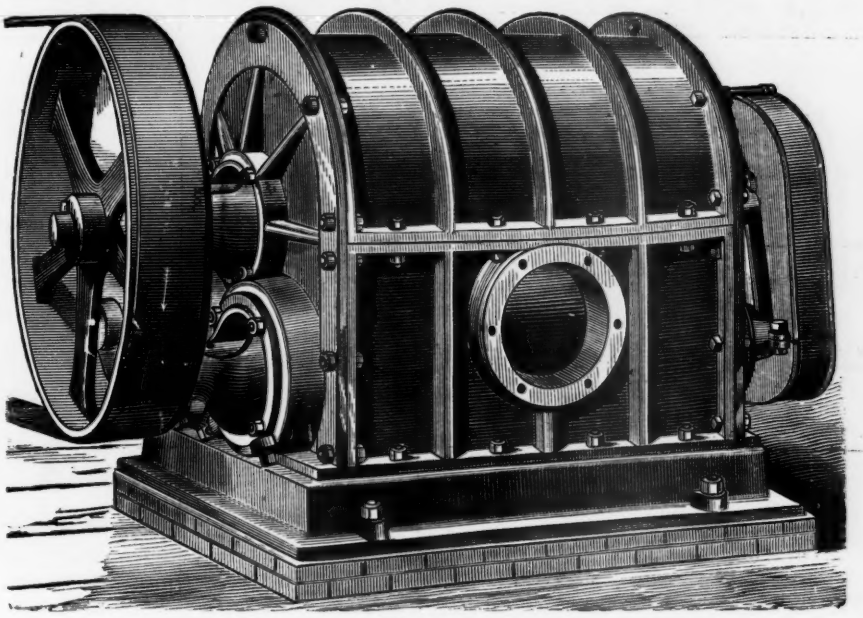
BOSTON, MASS.

91 Liberty Street, NEW YORK. 135 N. Third St. PHILADELPHIA.
16 S. Canal St. CHICAGO. 75 Queen Victoria St. LONDON.

STOCK CARRIED AT BRANCHES.

The Baker Rotary Pressure Blower

ONLY ONE BELT IS REQUIRED TO DRIVE THE LARGEST BLOWER.



The Best POSITIVE PRESSURE BLOWER for IRON FOUNDRY CUPOLAS, Pneumatic Tubes, Water Gas Works, Smelting Silver, Lead, or Copper Ores, Sand Blast, Forge or Knobling Fires, Ventilating Mines or Tunnels or any other purpose requiring a POSITIVE BLAST OR EXHAUST.

Wilbraham Baker Blower Co.,

2518 Frankford Ave., PHILADELPHIA, PA.

DIRECTORY OF LEADING PIG IRON DEALERS.

HUGH W. ADAMS & CO.

Pig Iron Merchants

15 Beekman Street, NEW YORK

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HENRY H. ADAMS & CO.

(Incorporated)

PIG IRON

Sole Agents for the Celebrated "NORWAY," for combined Strength and Softness.

177 Broadway,
NEW YORK CITY, N. Y.

MATTHEW ADDY & CO.

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Agencies.

Chicago, Detroit, New York,
Philadelphia.

CLINTON IRON & STEEL CO.

Manufacturers of the

CLINTON INSPECTED FOUNDRY IRON

CELEBRATED "CLINTON" SOFTENER

PITTSBURG, PA

15 Cortlandt St., NEW YORK.

DAYTON COAL & IRON CO.

(Limited.)

PIG IRON.

DAYTON, Tenn. CINCINNATI, Ohio.

F. A. GOODRICH & CO.

Incorporated

PIG IRON, STEEL, COKE, ETC.

Detroit, Mich.

PICKANDS, BROWN & CO.,

Manufacturers, Importers
and Dealers in

PIG IRON AND IRON ORE.

Rookery Building, CHICAGO.

ROGERS, BROWN & CO.

CINCINNATI, CHICAGO.

BUFFALO,

PHILADELPHIA, NEW YORK

ST. LOUIS

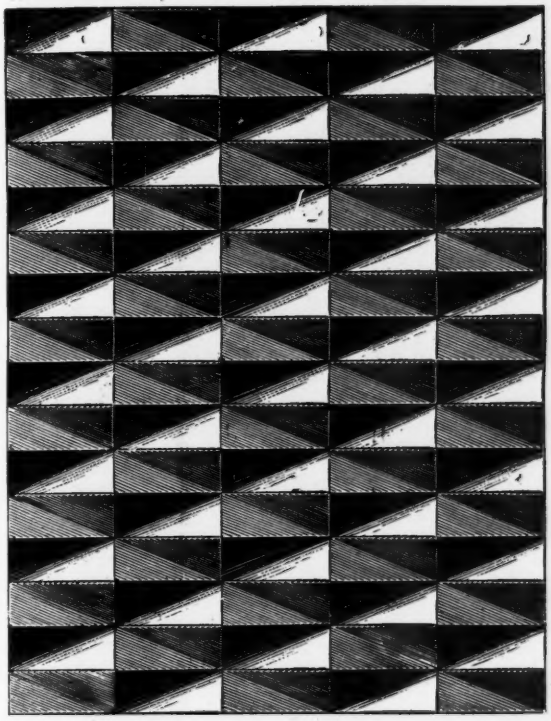
SLOSS IRON & STEEL CO.

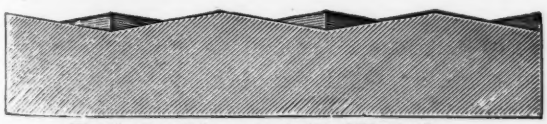
BIRMINGHAM, ALA.

SLOSS PIG IRON

D. L. Cobb, Sales Agent

1145 Monadnock Block, CHICAGO, ILL





The above cut shows exact size of Diamonds.

Diamond Pattern Lumber,

—FOR—

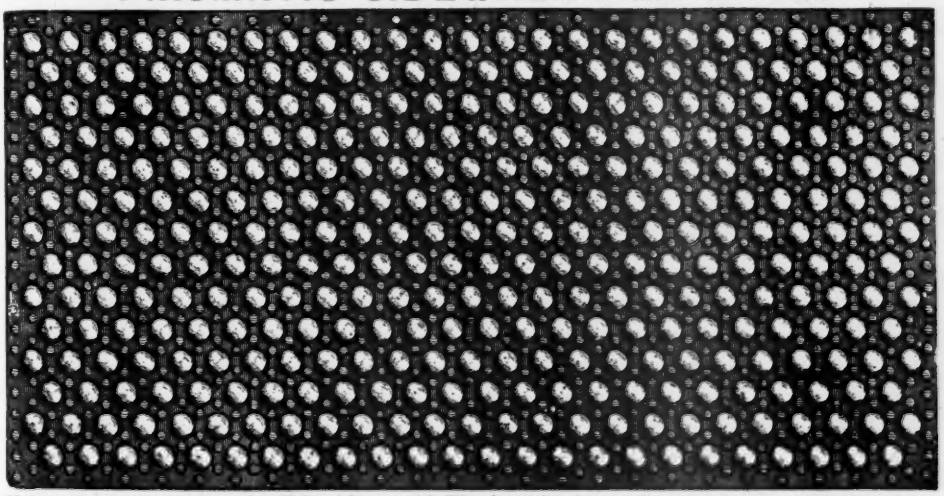
DOOR SILLS, PLATFORMS, STEP PLATES, Etc.

This Patent Lumber is made by a Special Machine invented by us, the ONLY Machine of its kind, and each piece will match PERFECTLY with all other pieces, by "joining" the edges to the centre, lengthwise, or any row of Diamonds. Size of each piece, 8 feet long by 6 inches wide, and ⅛ inch thick. Price 10 cents per running foot of 6 inches in width, NET CASH crated and delivered f. o. b. Chicago, in orders of not less than 6 pieces. Send for sample.

BROWN BROS. MFG. CO.

Cor. Clinton and Jackson Sts. Chicago.

PRISMATIC SIDEWALK LIGHT TILE.



Make your own frames and we will furnish you with Tiles for either Iron or Concrete Lights. Write for prices.

BROWN BROS. MFG. CO.,

Mention THE FOUNDRY. **Cor. Jackson and Clinton Sts. CHICAGO.**

THE APEX
OF
Bicycle Perfection

is represented in the Monarch. All the bicycle goodness that the best bicycle makers know is incorporated in this king of wheels. No chronometer could be made with more care, or with greater accuracy. Every part of the

Monarch

is in perfect harmony with all other parts. So perfect is the distribution of weight, so accurate the adjustment of gear, that the Monarch will outspeed, outlast, outrival, any wheel on the market to-day.

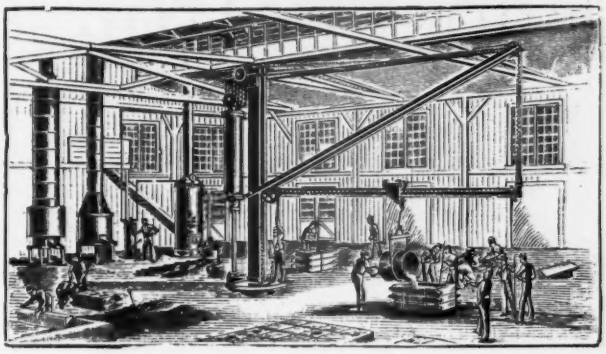
Made in 4 models. **$80** and **$100.** For children and adults who want a lower priced wheel the **Defiance** is made in 8 models, **$40, $50, $60** and **$75.** Send for the Monarch book.

MONARCH CYCLE MFG. CO., Lake, Halsted & Fulton Sts., CHICAGO.
83 Reade St., New York.

"More, Ridgway, Send Us Some More!"

A few weeks ago the A. A. Griffing Iron Co. of Jersey City, N. J.—the biggest foundry there—concluded they would try a Ridgeway Crane.

Well, it is the same old story—kind a tired telling it over and over so often. They hadn't got the crane a going long before here they come crying, "More, Ridgway, send us some more!" And besides are jumpin' up and down hollerin' "hurry! hurry!! hurry!!!"



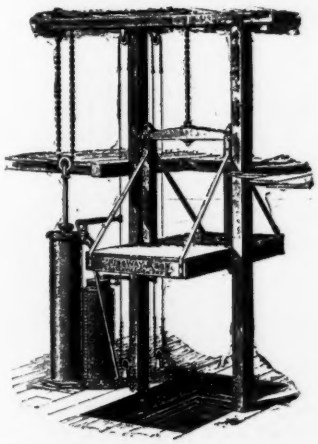
5-ton Steam-Hydraulic Crane in a Foundry.

What are they in such a hurry for? Simply because they now find that every day they haven't Ridgway Cranes, they are losing money. You, Mr. Foundryman, are doing the same, but the difference between you and the Griffing people is that you are not smart enough to find it out for yourself or believe it when we and other people tell you.

Oh yes, your hand, steam, electric, hydraulic and air cranes are all right—very nice indeed, in their place—but they are no more to be compared to a Ridgway Crane for foundry service where the foundry is run for profit and not for style, than a pair of kicking mules to a tug boat, when it comes to "getting there."

If you got a Ridgway Crane in that foundry of yours—don't care how finely equipped you are—those old eyes would pop open like chestnut burrs at the end of your first month as your cost sheet lay before you with stationary wages and growing output.

Don't believe it, do you? Of course not. Suppose you ask these keen, wide awake Griffing people and the hundreds of others who work these cranes in their foundries. The typewriter you have and four cents is the postage. We can't tell everything in a page card, can only say the Ridgway Crane is the most wonderful money maker ever put in a foundry. You must do the rest.



Steam-Hydraulic Elevator, also made direct acting with cylinder under platform.

"PLEASE TAKE THE ELEVATOR"

—Shouldn't
—dream
—of any
—other.

Craig Ridgway & Son,

COATESVILLE, PA.

JOHN J. SHIPHERD, Pres. W. RUSSELL, Vice-Pres. and Mgr.
L. C. SHIPHERD, Sec'y and Treas.

THE

Phoenix Iron Works Co.

The following is a letter which was sent to us unasked for and is a sample of many genuine indorsements which we receive very frequently.

OFFICE OF
BERT. L. BALDWIN, M. E.
CINCINNATI, O.

PHOENIX IRON WORKS CO.
CLEVELAND, OHIO.

GENTLEMEN—As you may remember, you furnished a 10 ton traveling Crane which was erected at the Cummingsville Generating Station for the Cincinnati Street Ry. Co. This crane was erected for the purpose of handling the heavy parts of the Railway Generators. The easy working of this crane was appreciated by the party, who had the contract for erecting the generator, who found that where it required eight men at the hoisting chain of one of our other cranes, it only required three at your crane, with both cranes handling the same load. All of the details on this crane are well worked out and substantial, so that I expect that it will continue to give us the best satisfaction.

Yours respectfully,
(Signed) BERT L. BALDWIN.

MANUFACTURERS

Hand, Steam, Belt, Hydraulic and Electric Cranes

FOR ALL PURPOSES.

Foundry Ladles, Chains, and General Machinery

WASON STREET.

CORRESPONDENCE SOLICITED.
WRITE FOR CATALOGUE.

CLEVELAND, OHIO.

Eastern Office: HARRY W. JENNINGS, Agt., Fulton and Cliff Sts. NEW YORK, N. Y.
New England Office: THE JOHN WALES CO., 139 and 141 High St. BOSTON, MASS
CHICAGO OFFICE, 1430 OLD COLONY BUILDING.

Just Enough Wind

and at the right pressure for the best results is what you obtain with a

Roots' Positive Pressure Blower

OUR CATALOGUE is Interesting.
OUR TESTIMONIAL SHEET Convincing.

Write for Them

P. H. & F. M. Roots Co.,

Connersville, Indiana.

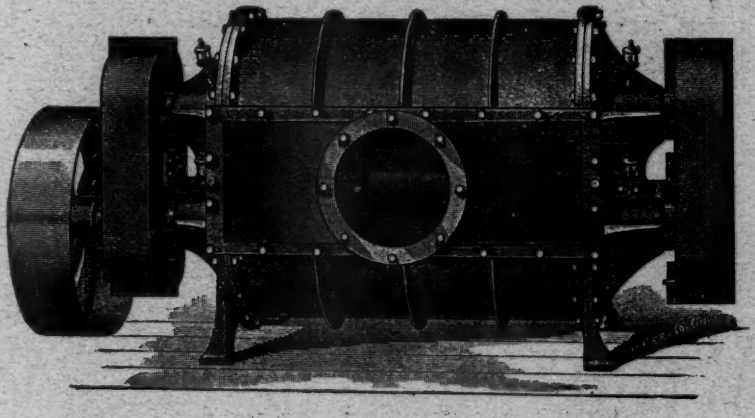
OVER

25,000

Roots' Positive Pressure Blowers

Have been put on the market.

—1859—



—1896—

They are Unequalled.

P. H. & F. M. ROOTS CO.,

CONNERSVILLE, IND.

THE GREATEST MONEY SAVER
EVER OFFERED THE
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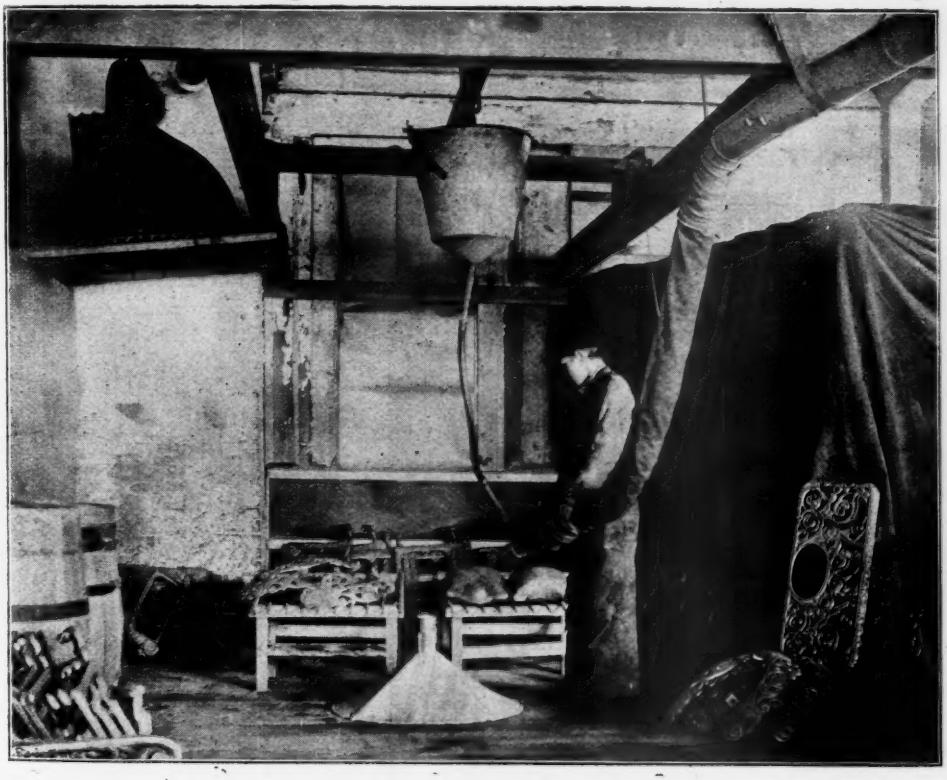

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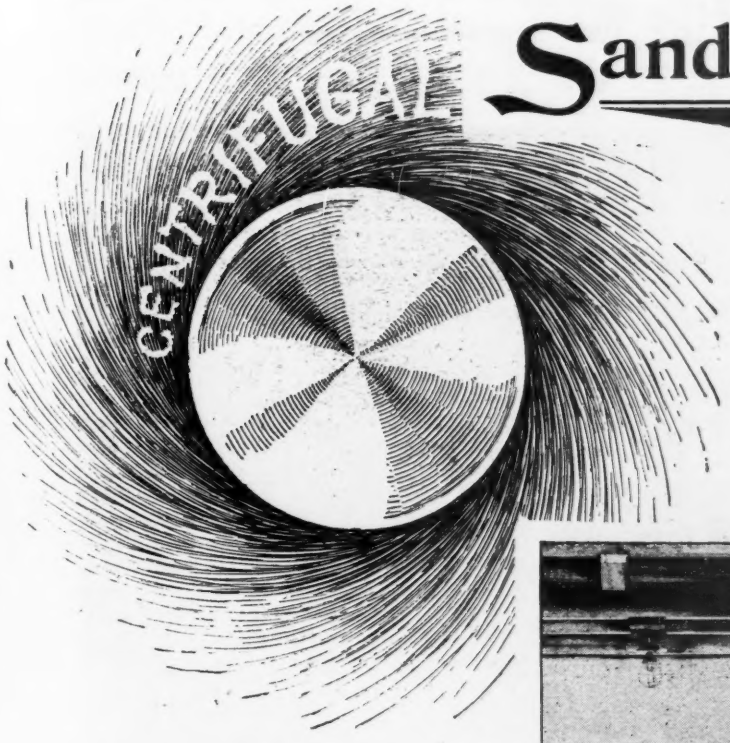

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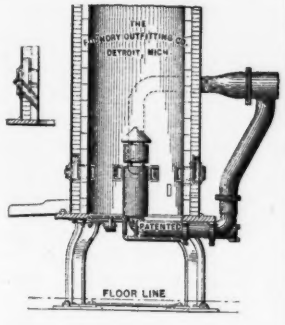

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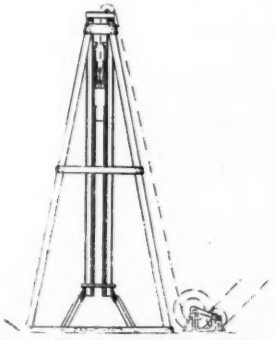


TUMBLERS . SAND SIFTERS
LADLES . ELEVATORS . TRUCKS . TURNTABLES

THE FOUNDRY

VOL. 7. DETROIT, MICH., MARCH, 1896. No. 43

Making a Large Kettle in Loam.

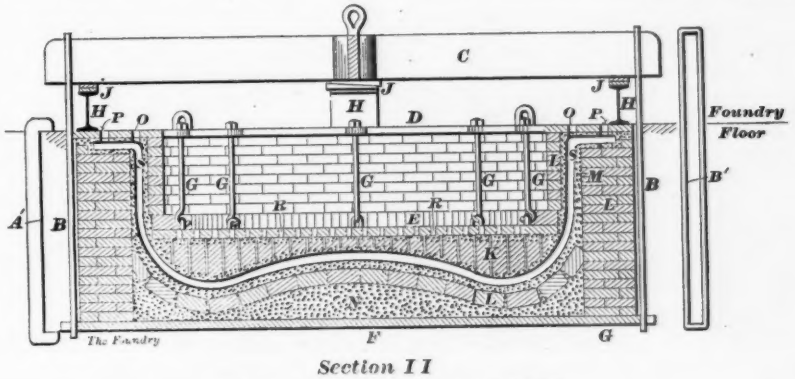
Our illustrations show a large kettle weighing 18,000 pounds, or 9 tons, several of which were recently manufactured by the Riverside Iron Works, of Kansas City.

In Fig. 1 the sectional view of mold shows the method of molding with sufficient clearness to make it plain to the average foundryman. A center and spindle was used to sweep the outside, which was built on the bottom plate, one course of brick being laid over the bed of coarse cinders which was built upon bottom plate, and from the outer side to top a brick wall 16 inches thick was built because of the 12-inch flange leaving a bearing of 4 inches all around for cope.

The core was much more difficult to make. A plate had been previously constructed with a large number of long "prickers" of varying lengths cast in it and containing the necessary holes for vent. This was turned upside down and bottom of core swept on, and after being thoroughly dried in oven it was taken out, turned over on a pile of loose sand and then hoisted by the eye hooks on other side of plate onto four short pins about 6 inches square, and with the aid of sweep and spindle the side of core was built of one thickness of brick to the proper height; then top plate was placed in position and bolted, and the three bolted firmly together. The top plate had to be dried on the floor and finished there, as oven was too small to hold it when completed. It was concerning this mold that the item has been floating the rounds of the trade press, concerning the compressed air incident. Some of those who have read this statement have seen fit to make fun of it, while others again have thought it possible. Thomas Cowie, the foreman under whose management the casting was made, and who is seen standing beside it in Fig. 3, tells the story thus:

"Everything was in readiness," he said, "to lower the core. This was done and it was found that a few trifling alterations were necessary, so the order was given to raise it. When it had gone up about eight inches the chain supporting it suddenly broke and the big core dropped into the pit.

"Of course, everyone thought the whole business was ruined. You see, this core weighed 14,000 pounds and a drop of two inches would have been sufficient to shatter it into molding sand and cinders. When it was lifted out, however, to the astonishment of everybody, there was not a dollar's worth of damage done. When the core fell there was eight inches of air between it and the bottom of the mold. This air was compressed and it let it down as gently as one



Section II

Fig. 1—Sectional view of Mold.

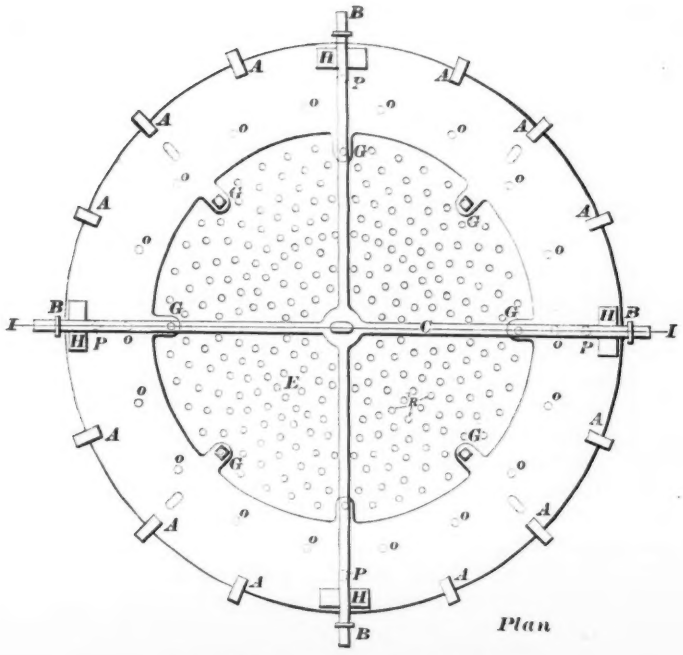


Fig. 2—Top view of Mold.

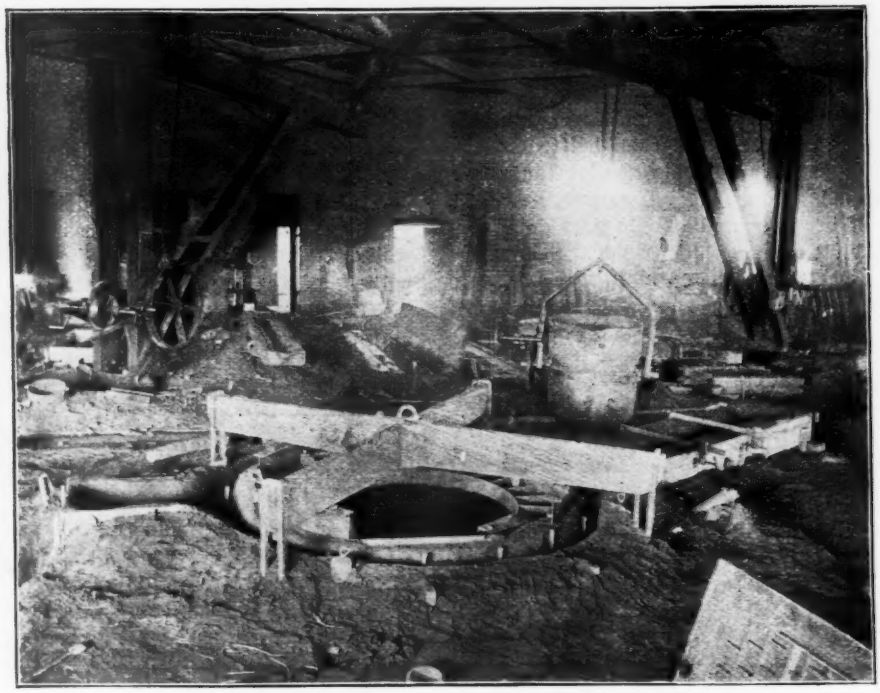


Fig 3—Mold as it looked before pouring.

would place a delicate piece of bric-a-brac upon the piano. If ever I felt grateful for the resisting power of compressed air, it was then."

At first this may seem overdrawn, but a glance at the mold and its construction in Fig. 1 shows plainly how easy this would be. It will be noticed that the sides are straight up and down or nearly so, and when the core commenced to fall the large volume of air underneath it was suddenly compressed, the only outlet being through side of mold, and when the core came within a few inches of its place and the joints about the edge commenced to approach that aperture was quickly closed and the only outlet was the gate and rises. Owing to the speed at which the core would naturally fall but little of the air would escape before the mold was almost closed and then the rapid compression would cause a resistance that makes Mr. Cowie's statement easily understood.

In our illustrations A represents the cast iron clamps employed to hold mold together, while A' shows clamp in detail. B are wrought iron link clamps, and B' detail of same. C is the cast iron cross; D, top plate; E, center core plate, and F, bottom plate; S, suspension rods, and H I, beams; J, wedges; K, prickers; L, brick work; M, loam; N, cinders; O, gates; P, risers; R, gas vents, and S, metal space. The diameter of kettle over flange was 11 feet 5 inches; diameter inside, 9 feet 3 inches; depth in center, 2 feet 6 inches; depth of sides, 3 feet. Thickness of metal, 2 and 2½ inches, and capacity 70 tons of lead.

Fig 4—Finished Casting.

Manipulation and Deterioration of Cast Iron.

By H. J. GRAF.

Before making a brief description of the scientific and frugal principles of melting cast iron in cupola furnaces, I will describe what cast iron and its characteristics are. Cast iron is simply a chemical mass; its characteristics depend upon its molecules, and the characteristics of the molecule depend

upon the substances from which it is produced. The characteristics of the substances which make up the molecules always vary according to the composition and mode of production. The word molecule is used to express the unit of a substance; whatever these substances are in any particular case must be ascertained by studying the chemical action from which it is produced, and the chemical changes it undergoes during the melting operation.

While melting cast iron in cupola furnaces, the first thing to become affected by heat is the molecules, as it does the heat passes from one part of the molecule to another, at the same time carrying its energy with it while in the act of transmission. The time for the molecule to part company from the iron depends upon the temperature in the cupola. When that time arrives the iron is fused into liquid mass. While the iron is in its liquid state it will reach and take up the absorbing gases in the cupola. As the iron is poured into the molds it cools, and as it passes from a liquid to a solid state the multitude of crystals keep swimming in the liquid mass until the liquid mass in which the crystals are swimming becomes solid. I will not go into the details connected with the deterioration which takes place during the solidification, etc., but will follow implicitly upon the principles which this article is based.

The volatilization of the different substances which make up the characteristics of the molecule differs in its densities. It therefore enables it to effect a partial separation during the melting of the iron. It also enables us to eliminate the elements not wanted, and elect the elements necessary to remain. This can be done in the cupola directly, as well as the decarbonization or recarbonization is done indirectly in the manufacture and procedure of making malleable iron and steel. If all the substances which make up the molecules of the iron were constituted of one element, the whole mass would be equal and the iron would be homogeneous.

I will now describe the difficulties which beset a founder in making homogeneous castings. The characteristics of cast iron always depend upon the character of the carbon, which is always altered during the melting operation, varying according to the mode of production. In order to produce iron high in graphitic carbon, we usually use pig iron with a good percentage of silicon. Silica promotes the formation of uncombined carbon. The percentage of graphitic carbon wanted is usually regulated with silica irons. However, the silica will not prevent deterioration and combinations from taking place in the furnace during the melting operation. Hence we exercise great precaution to prevent the deterioration from taking place. Now let us inquire into the phenomena and difficulties which beset a founder from obviating these great deteriorations, etc. Good fuel is very essential in the production of castings, because poor fuel will always originate large quantities of collected gases in the cupola (varying according to its characteristics). The action of heat upon these collected gases causes an evolution, a chemical reaction then takes place, counteracting and affecting the equilibrium of the mass. Again, these collected gases unite chemically with the elements of the mass, thereby deteriorating the characteristics of the molecule. Very often the fuel is found very poor in quality. When such is the case it will require extra fuel consumption, thus increasing the quantities of collected gases and preventing the consumption of the fuel to a maximum advantage. You well know that if a small quantity of collected gases are originated with a small quantity of fuel, we certainly increase the collected gases proportionately with a larger quantity of fuel. Again, should too small a quantity of fuel be used it will sacrifice the temperature of the melted iron. At the same time it will enable the iron to become deteriorated by leaving it too long in its semi-fluid condition and subjected to the action of the blast for too long a time. When such is the case the iron becomes decarbonized. Again, very often the cupola is charged with more fuel than will fuse in a given time for the iron to melt. When such is the case the coke will not fuse fast enough, consequently the fuel will increase in quantity until the iron is forced to melt up near the charging door, or too far above the tuyeres. The iron melted under these conditions does so very slowly, and as it drips down through the diffused air and collected gases it becomes decarbonized to a considerable extent. As it drips down into the liquid metal below it

either deteriorates it in spots or in whole. As remarkable influences are brought about by very small quantities of impurities, we can readily see the essential points in melting with good fuel, and as we do not analyze the fuel we judge its characteristics with the naked eye. We therefore do not know what deteriorating elements the fuel contains until after it is used and tested.

Air is also as essential in the melting of iron as fuel, and to obtain good results it should be used as intelligently as fuel. Air contains nitrogen and oxygen and also moisture. Nitrogen is an incombustible element. Oxygen is not combustible, though it adds to the combustion. The moisture in the air is generated into a hydrogen gas, which is capable of producing a very high temperature. Whenever the air is forced into the cupola at too high a pressure it will obstruct the volume as well as the intensity of the heat, thus congealing the iron and slag around the tuyeres, thereby obstructing the cupola, decreasing the melting capacity and delaying the time in melting. Iron which is melted under this condition is left too long in its semi-fluid condition. The action of the blast upon this semi-fluid mass decarbonizes it, as in the procedure of blowing air in a converter for the making of Bessemer steel.

It is a universal fact that the most scientific and economical method of melting iron is by doing so fast, which will enable it to drip down below the tuyeres suddenly, where it is protected from the cold air, etc. The temperature and pressure in the cupola should be regulated to exact degree. When such is accomplished the correspondence of the substances are brought to nearly the same in equilibrium.

I have found in my experience that iron will only hold a very small percentage of graphitic carbon. While being melted at a very low temperature it will evidence itself by rising as a scum on the surface of the liquid iron. Castings poured with such irons are usually found dirty and poorly solidified. The graphitic carbon always precipitates itself toward the surface at the point of solidification. Consequently the iron melted at a very low temperature begins to give up its graphitic carbon immediately after leaving the cupola, because the iron is then near its point of solidification. Hence the necessity of melting iron at a very high temperature. In order to have it hold a suitable percentage of graphitic carbon, for small castings it should be fused at a temperature of about 4,200 Fahr. Now let us inquire why such is the case. To melt iron it will require a temperature of 2,800 Fahr., and as the usual temperature in the cupola is about 3,500 Fahr., we have only 700 Fahr. heat doing service, or, in other words, only one-fifth of its volume doing service. Iron melted with less than 3,500 Fahr. is almost useless as above mentioned. Iron melted at a temperature of about 4,200 Fahr., and as the temperature to melt iron is about 2,800 Fahr., we have 1,400 Fahr. heat doing service, or, in other words, one-third its volume above the efficiency. Hence the point that iron is better melted rapidly, at the same time preventing deterioration to a considerable extent, etc.

The Mobility of Molecules of Cast Iron.

By ALEXANDER E. OUTERBRIDGE, JR.

It has been generally accepted as a fact that cast iron under the influence of repeated shocks becomes brittle and will finally break under a blow which otherwise it would have withstood. It will probably surprise metallurgists therefore to learn that experience disproves the supposed fact and establishes exactly the opposite condition.

The result of about a thousand tests of bars of cast iron of all grades, from the softest foundry mixtures to the strongest car wheel metal, enables me to state with confidence that, within limits, cast iron is materially strengthened by subjection to shocks of repeated blows.

It is very well known that the usual process of annealing castings—such, for example, as car wheels—increases their strength by releasing cooling strains.

It is not well known, if known at all, prior to this announcement, that the molecules of cast iron are capable of movement—for they do not touch each other—without the necessity of heating the casting, and they can thus rearrange themselves in comfortable relation to their neighbors and relieve the overcrowding near the surface of the casting, or, in more technical words, a molecular annealing may be accomplished at ordinary temperatures

which will release the strains in the castings precisely as does annealing by slow cooling in heated pits or ovens. Such a surprising statement should not be made without sufficient data to establish the correctness beyond cavil, since it is contrary to former belief, certain to be questioned, and properly so. Before proceeding to give a record of the experiments which have been made and which can readily be repeated by anyone, a brief history of the origin of the first observation leading thereto may be interesting.

I noticed in the year 1885 (being at that time engaged in metallurgical work at a large car wheel establishment) that chilled cast iron car wheels rarely cracked in ordinary service after having been used for any considerable time; if wheels did not crack when comparatively new, they usually lasted until worn out or condemned for other causes. No application was made of this observation at that time, further than to institute a careful investigation of the condition of he annealing ovens when some new wheels were returned cracked, under the supposition that the wheels were not well annealed, and an equally careful revision of the iron mixture to ascertain whether the fault lay therein.

In 1894 a large number of "transverse test bars" (1 inch square, 15 inches long) accumulated in the foundry of William Sellers & Company, Incorpated, and to expediate the cleaning of sand from their surfaces they were all thrown into an ordinary "tumbling-barrel," with other castings, and knocked about for several hours. When these test bars were broken upon the transverse testing machine and the records tabulated I noticed with surprise that the average strength of the entire series was considerably higher than was usual with similar iron mixtures. This difference was fortunately sufficiently marked to cause a careful inquiry, first into the condition of the testing machine, then as to the chemical composition of the metal in the bars. The machine was found in good order; the metal was normal. A card pattern was then made, upon which 12 test bars could be molded side by side in one flask and poured from one runner. Six of these bars were placed in the tumbling-barrel and the other six were cleaned of adhering sand with an ordinary wire brush; the 12 bars were broken upon the machine. All of the bars which had been subjected for about four hours to incessant blows in the tumbling-barrel were stronger than the companion bars; the actual gain varying from 10 to 15 per cent; this metal was soft foundry iron.

These tests were repeated on several consecutive days, with similar results, while various theories were being suggested and clues "run out" to detect the hidden cause of this strange fact.

One plausible explanation offered was that the rubbing of the bars together in the machine slightly rounded the corners, and thus prevented a starting point for a "check" or break of the bar, under the strain in the testing machine.

This theory was soon overthrown by tests. The corners of six bars were rounded by filing; the companion bars were not filed. All of the bars were cleaned with a wire brush and broken upon the transverse testing machine. There was no apparent gain in strength in the bars with rounded edges.

Round test bars (1 1-8 inches diameter, 15 inches long) were then poured from one ladle of iron, some of these were cleaned in the tumbling-barrel and all that were so treated proved to be much stronger than the companion bars which were merely cleaned with a wire brush.

This process of eliminating false theories was continued until finally a new explanation occurred to me, and simultaneously a convincing test of its accuracy suggested itself. The explanation is indicated in the title of this paper, "The Mobility of Molecules of Cast Iron," at ordinary temperature, when subjected to repeated shocks.

The crucial test referred to was in subjecting six bars to 3,000 taps each with a hand hammer upon one end only of each bar. All of the bars so treated showed a gain in strength equivalent to the gain exhibited by bars which had been subjected to blows over the entire surface for several hours in the tumbling barrel. Here was a new revelation of scientific interest to the metallurgist, and suggesting to the founder the possibility of annealing castings at ordinary temperatures by availing himself of this molecular mobility. It also proves that he has for many years been unconsciously accomplishing this beneficial result—at least partially and irregularly—by tumbling small castings in a re-

volving barrel, merely for the purpose of conveniently cleaning them from adhering sand.

Another interesting fact is incidentally brought out in the investigation, viz: that the strain caused by cooling, and consequent weakening, exists even in the smallest castings, where we would naturally expect that the cooling would be practically uniform throughout the section; also that, even in bars of a uniform section, such as 1-inch test bars, the weakening by cooling strains sometimes amounts to more than 10 per cent of the ultimate stress. Repeated tests show that 1-2-inch bars, in which he fracture is comparatively uniform to the eye throughout the section, are subject to the same law. Other tests show that the comparative difference in transverse strength between bars which have been hammered on their ends, or otherwise subjected to the process of molecular annealing by vibration when cold, and companion bars, cast in the same flask, but not so improved, depends to a certain extent upon the number and force of the blows, and, to a still greater degree, upon the grade of cast iron tested. For example:

1. Greater relative difference is found in hard mixtures (or strong iron) than in soft mixtures or weak iron.

2. Greater relative difference is found in 1-inch bars than in 1-2-inch bars, and somewhat greater difference in 2-inch bars than in 1-inch bars.

The foregoing experiments have been repeated sufficiently often to satisfy me of their absolute reliability (and really remarkable uniformity), a new series of tests was commenced for the purpose of ascertaining how many blows were required, and approximately what force was needed to accomplish the desired object of relieving cooling strains. A new machine was constructed for this purpose and light was soon thrown upon these questions, while still other important questions were suggested and answered by the use of the same machine.

The impact machine at first used was an old one, and consisted of a weight fastened to an arm swinging in a gradual arc. The friction of the pivot and the crude construction of the machine precluded certain or even approximately sure results as to the force of the blow delivered.

The new machine consisted of a frame or yoke, marked in inches, and a wedge-shaped weight adapted to the size of the bars to be tested, which was raised perpendicularly to any desired number of inches, and, when released, fell by gravity in free space, striking the bars in the center between the supports, which were 12 inches apart. A 14-pound weight was adopted for testing 1-inch bars.

Impact testing machines have long been used, and car wheels are accepted or condemned upon tests made upon such machines. It has always been maintained that each blow of the "drop" weakened the casting, and the final blow was only a record of the residual cohesion, remaining in the metal after previous blows had proportionately weakened it. In the case of a thoroughly annealed car wheel, this reasoning may be sufficiently correct; but as applied to impact testing machines used for testing unannealed bars, the argument is absolutely fallacious. The impact testing machine is itself a means of molecularly annealing test bars.

Six of the 1-inch square test bars cleaned with the wire brush were broken upon the impact machine by dropping the weight from a sufficient height to break each bar at the first blow. The six companion bars, also cleaned with the brush, were then in turn subjected to blows, numbering from 10 to 50 each, of the same drop weight, falling one-half the former distance; these blows being insufficient to break the bars. The weight was then permitted to fall upon each of these bars in turn from the height at which the six bars previously tested were broken on first blow. Not one bar broke. Two, three, six, ten, and in one case fifteen blows of the same drop from the same extreme height were required to break these bars. In another similar case, the weight was dropped once from the former height, then raised by inches until four more blows, each being one inch higher than the last, were delivered before breaking the piece. Subsequent tests gave still greater gain in strength.

The next experiment with the impact machine was designed to test molecularly annealed bars from the tumbling-barrel in comparison with untreated companion bars, under one heavy blow. It was found that a blow of sufficient force to break the unannealed bars with one fall of the weight must be repeated from 5 to 20 times (depending mainly

upon the nature of the iron mixture) to break the molecularly annealed companion bars. By careful experiment in the manner previously noted, the ultimate strength of the bars which had not been through the tumbling-barrel could be increased, by excessive slight blows upon the impact machine, to an equality with their companions.

The experiments here related in a running conversational narrative, form a part of the daily records of metallurgical work at the foundry of William Sellers & Company, Incorporated, Philadelphia, and the aggregate number tabulated is very large indeed. All of the tests corroborate to the fullest degree the statements made; and they are susceptible of repetition and conformation by any one interested in work of this character. They form a part of a long series of investigations (extending over a period of 15 years) upon the relation between the physical nature and chemical composition of cast irons. They have served to throw some light upon hitherto obscure phenomena in the design, construction, etc., of castings; and, as it is believed that they contain the germ of a new scientific discovery, valuable in its principle to all workers in these fields, these brief notes are presented to the institute in response to the invitation of its secretary, and through the courtesy of the firm of William Sellers & Company, Incorporated, for whose benefit and at whose cost they were primarily made.

In conclusion, it should perhaps be stated, to avoid the possibility of misunderstanding, that the molecular annealing of cold cast iron by successive slight shocks differs from annealing by heat, in that it has no power to change the condition of carbon in the casting, or to alter the chemical constitution in any way. All that is claimed is, that every iron casting, when first made, is under a cond'tion of strain due to difference in the rate of cooling of the metal near the surface and that nearer the center, and also to difference of section; further, that it is possible, and practicable, to relieve these strains by tapping repeatedly the casting, thus permitting the individual metallic particles to rearrange themselves, and assume a new condition of molecular equilibrium.

The large number of tests made, and the re-markable uniformity of results obtained, permit me to make these statements with full confidence that their repetition, even under less favorable conditions for accurate observation than I have enjoyed, will serve to convince others of their correctness, and perhaps to establish a new law of the physics of cast iron.

A few practical deductions of universal application may be drawn from these observations.

1st. Castings, such as hammer frames, housings for rolls, cast iron mortars or guns, which are to be subjected to severe blows or strains in actual use, should never be suddenly tested to anything approaching the severity of intended service. Quantitative tests made upon the impact machine prove that the molecules of cast iron rearrange themselves under reasonably few shocks, so that it is perfectly practicable to molecularly anneal such castings when cold. Pulleys, and indeed all castings, are subjected in everyday service to this process of molecular annealing; and old castings are therefore more reliable than new ones, unless misused. It is not impossible that the same law applies to steel castings, and perhaps to all metal castings; and in testing new guns each preliminary small charge of explosive material, subjecting the casting to comparatively moderate shocks, enables the gun to relieve itself of internal strains, and eventually to withstand with safety shocks which would have destroyed it without this precautionary measure. This, however, is mere theory and must not carry the weight of the arguments regarding cast iron, which are clinched by a thousand actual tests.

2nd. Strong iron castings, and castings of irregular section, have greater initial strains than soft iron castings or castings of comparatively uniform section; and it is, therefore, more important to subject such castings to gradually increasing shocks, until the strains are relieved by the movement and rearrangement of the molecules.

The tables appended hereto show the results of tests for transverse strength of test bars of different section and widely different grades of iron, which have been subjected to this process of molecular annealing, and also tests made upon the impact machine with test bars cast in the same molds. In order to avoid unnnecessary duplication of figures, a few individual tests only are here tabulated;

but they represent the average of probably a thousand records.

The largest apparent gain in transverse strength of companion bars of 1-inch section, shown in the first table, is 525 pounds (see last line), or very nearly 19 per cent.

It is evident, even without plotting all the tests, that they would show a gradually ascending curve, having direct relation, first, to the character of the alloy of iron; second, to the number of blows given, up to the point when strain is relieved, beyond which an increased number of blows does not increase the strength of the bar. Furthermore, it may be noted that these tests with the impact machine prove the existence of a similar law in relation to the ability to resist sudden and severe shocks.

Similar observations apply to the tests recorded of ½-inch and 2-inch bars. All of the 2-inch bars were broken upon the testing machine of Messrs. A. Whitney & Sons, by their operator, who was at first ignorant of the object of the tests. Subsequently, similar tests were made by that firm with their car wheel iron, and identical results were obtained by them.

TABLES.

The tabulated tests were selected from daily records of experiments made at the Machine ool Works of William Sellers and Company, Incorporated, Philadelphia.

In Table I, the left hand columns show the breaking strain, deflection and resilience, of test bars of different kinds of cast iron, cleaned in the ordinary manner with a wire brush. The right hand column show companion bars cast from the same runner, molecularly annealed by being subjected to shocks in the tumbling-barrel, or by tapping on end with a light hammer, as noted under "Remarks." Also a few tests made with round bars 1⅛-inch in diameter, cast on end.

Table II. gives a few of the tests with 1-inch bars made upon the new impact testing machine, using a 14-pound weight.

The tests marked A represent bars cleaned with a brush; tests marked B represent companion bars, molecularly annealed in the manner described.

Table III. gives a few records of 2-inch test bars broken by A. Whitney & Sons upon their machine. The tests marked A were cleaned with the brush; those marked B were molecularly annealed in the tumbling-barrel.

Other experiments have suggested themselves in the course of this investigation; and my paper, therefore, is not presented as an exhaustive, but as a tentative treatment of this interesting, and, I believe, novel line of research, which is not devoid, even in its present stage, of some practical appplication.

Breaking Strain. Pounds.	Deflection Inches.	Breaking Strain. Pounds.	Deflection Inches.	Remarks.
2 350	0.13	2 850	0.14	Close grained iron.
2 025	0.12	2 300	0.14	Open " "
2 125	0.13	2 272	0.14	" " "
2 275	0.13	2 400	0.14	" " "
2 525	0.14	2 850	0.15	Close " "
2 175	0.13	2 500	0.15	Open " "
2 100	0.13	2 375	0.14	" " "
2 025	0.12	2 300	0.14	" " "
2 775	0.14	2 900	0.15	Close " "
2 550	0.14	2 925	0.15	
				Hammered on end of bar.
2 150	0.13	2 250	0.13	
3 000	....	3 200	....	Round bars 1⅛" diameter.
3 000	....	3 150	....	Hammered on end of bar.
2 150	....	2 450	....	Round bars 1⅛" diameter.
2 100	0.13	2 425	0.15	Open grained iron.
2 100	....	2 400	....	Round bars 1⅛" diameter.
2 050	0.12	2 400	0.14	Open grained iron.
2 875	0.14	3 100	0.15	Close " "
2 175	0.13	2 500	0.15	Open " "
2 150	0.13	2 350	0.13	" " "
2 675	0.13	3 000	0.14	Close " "
2 775	0.14	3 300	0.15	" " "

TABLE II.

A. 1 blow of 14 lb. weight falling 13 in. broke the bar. Open grain.
B. 8 blows of 14 lb. weight falling 13 in. broke the bar. Open grain.
A. 2 blows of 14 lb. weight falling 14 in. broke the bar. Open grain.
B. 9 blows of 14 lb. weight falling 14 in. broke the bar. Open grain.
A. 2 blows of 14 lb. weight falling 14 in. broke the bar. Open grain.
B. 14 blows of 14 lb. weight falling 14 in. broke the bar. Open grain.
A. 2 blows of 14 lb. weight falling 13 in. broke the bar. Open grain.
B. 15 blows of 14 lb. weight falling 15 in. broke the bar. Open grain.
A. 3 blows of 14 lb. weight falling 15 in. broke the bar. Open grain.
B. 8 blows of 14 lb. weight falling 15 in. broke the bar. Open grain.
A. 2 blows of 14 lb. weight falling 15 in. broke the bar. Open grain.
B. 7 blows of 14 lb. weight falling 15 in. broke the bar. Open grain.
A. 3 blows of 14 lb. weight falling 13 in. broke the bar. Close grain.
B. 4 blows of 14 lb. weight falling 15 in. broke the bar. Close grain.
A. 2 blows of 14 lb. weight falling 13 in. broke the bar. Close grain.
B. 10 blows at 13 in., 5 and 15 in., 5 and 17 in., 3 at 18 in., broke the bar. Close grain.
A. 1 blow of 14 lb. weight falling 14 in. broke the bar. Open grain.
B. 20 blows at 13 in. and 3 blows at 14 in. broke the bar. Open grain.
A. 3 blows of 14 lb. weight falling 13 in. broke the bar. Close grain.
B. 15 blows of 14 lb. weight falling 14 in. broke the bar. Close grain.
A. 8 blows of 14 lb. weight falling 12 in. broke the bar. Close grain.
B. 50 blows at 12 in. and 10 blows at 15 in.

failed to break the bar.

Note.—The last bar, after withstanding these blows, was broken upon the transverse testing machine at a strain of 2975 pounds.

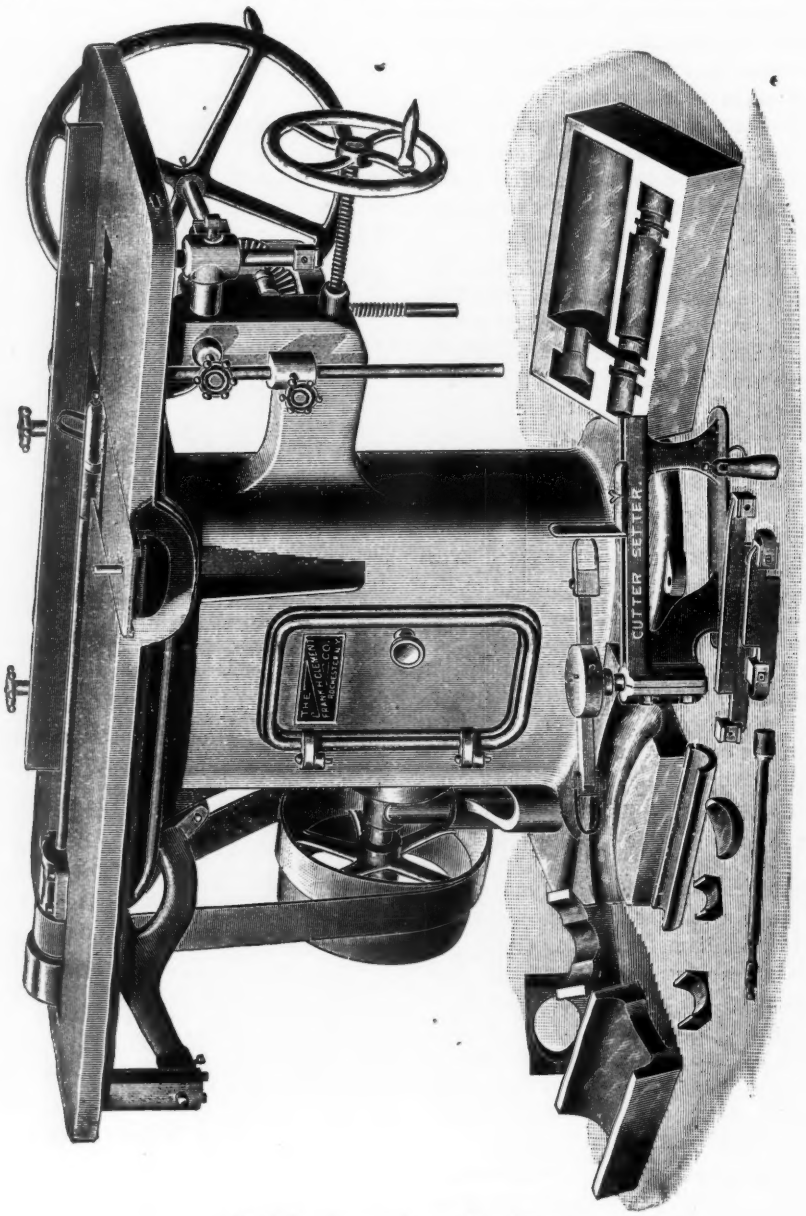
TABLE III.

	Breaking strain in pounds.	Grade of iron.
A	20 400	Close grain.
B	21 600	Close grain.
A	13 600	Open grain.
B	15 800	Open grain.
A	14 000	Open grain.
B	14 800	Open grain.

Core Box Machine.

We illustrate on this page a machine for making core boxes, the range of its production being well indicated by the specimens of its work shown upon the floor.

There is a steel spindle which is provided, near the driving pulley, with a box of ordinary construction, and near the end which



Machine for making Core Boxes.

A TECHNICAL JOURNAL DEVOTED TO FOUNDRY INTERESTS.

THE FOUNDRY

Published Monthly by

"The Foundry Publishing Co."

DETROIT, MICH.

JOHN A. PENTON,

EDITOR AND PROPRIETOR.

DETROIT, FEB., 1896.

Entered at the Post Office at Detroit, Mich., as second-class matter.

SUBSCRIPTION—One Dollar per year in advance in all parts of the United States and Canada; one dollar and fifty cents per year to all parts of the Universal Postal Union. May be sent by express, draft, money order, registered letter or U. S. postage stamps. Single copies, 15c.

CLUB RATES—Eight or more subscriptions sent at one time, 75 cents per year each. Cash to accompany order.

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THE FOUNDRY is issued promptly on the 20th. of each month, and will spare no endeavor to furnish valuable news and information to those interested professionally or incidentally in molding, melting, mixing of metals, foundry management, etc. Persons connected with any of these lines of industry will confer a favor upon the Editor of this Journal by sending him news from their section of the country pertaining to the foundry interests, particularly individual theories and experiences of practical value.

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The Trade.

Business is very very normal in the foundry line.

The consumers of castings and those who order them all seem to have a sort of incipient paralysis.

It is true, of course, that in several lines there is considerable doing, such as in pipe, stove and agricultural and malleable foundries, but in the general run of machinery and jobbing foundries a general listlessness is apparent. which all would like to shake off, if possible. There is a great falling off in the production and sales of pig, and an increase in the stocks on hand, although there does not appear to exist any great worry to dispose of them.

For a presidential year, less is heard of the effect of politics on business than formerly. This is probably owing to the fact that the country has already suffered so much during the past two or three years from every conceivable form of scare, and is getting used to it. It would not be surprising, in fact, to find a great improvement take place when the spring months arrive, and it needs but a little stimulus to inaugurate something in the way of a quiet little boom.

The National Foundrymen's Association.

May 12, 13 and 14 will be long remembered days in the history of the Philadelphia Foundrymen's Association. As a direct result of the efforts of this organization, seconded by the Chicago or Western Association, with the approval of the foundrymen of the entire country, it is expected that the city of Brotherly Love shall be again the birthplace of a national movement that it is hoped will be of great benefit not only to its members, but to all engaged in the business in any capacity. The purposes of this meeting are too well known to require enlarging upon here, and they will, in all probability, be definitely stated in the call that will probably be issued later on. It is the duty, however,of every honest, progressive, liberal-minded man engaged in the business to be there if he can possible arrange it.

Failing in that, he should take such measures as to him seem best and most appropriate to assure those who are there that they have his sympathy in any steps they

may take to mitigate existing evils or bring about a better condition of things in this business. It is certainly worth trying for, and those who are exerting themselves so unselfishly deserve nothing but praise, and they are entitled to a hearty support.

Krank's Korner.

Plans and calculations are laid down on paper in the form of drawings, not only to show those entrusted with carrying it out how this should be done, but also to satisfy the originator that he has got everything down.

* * *

Some people, when they want to start an industrial work of any kind, go up about two hundred feet in some sky-scraper and have a set of drawings prepared, calculating the capacity of the works entirely from this source. When the plant is started, and the output does not come as called for, like wienerwurst from a sausage machine, they step over to the telephone and hello and hello towards the manager.

* * *

Drawings are very well as far as they go, but they don't go far enough. On a drawing everything runs smooth and fast. Take a look at the plans of a foundry and you can almost see the floor full of molds. You can see the pig iron going up the elevator, the melter tapping out and the boys are taking care of the metal. You would not hesitate to sit down and figure up and say how many tons of castings would pass out through the big door every day. Hold that drawing close to your eyes and you don't have anything else but a busy and ever money-making scheme before you. It is one grand panorama of ever-changing beauty and grandeur coining dollars for you.

* * *

This is the drawing, look at the real thing, things that you never see on the drawing. Look at that mold blowing up; did you ever see that on a drawing? Look at that elevator cable running off the drum, when the blast is on and there is not half enough iron and coke on the scaffold. You never saw a picture of that. It may be a poor elevator, but it looks good on the drawing. Look at that man getting on a drunk just when you had a special job for him. Such conditions and things you never do see on a drawing, except a few men are killed, and then the daily press gives you a picture of your property that you can't recognize from the morgue.

* * *

You are furnished the plans for lighting your shop and you accept it right on the spot because you feel it is worth the price asked for it, but when the thing fails to work and you have to hustle around for some of the torches you used in the campaign of '92. I don't care whether you are a Republican or a Democrat, you will feel in either case that this is not the proper place to employ this primitive way of lighting. When the men do less work because you are not giving them enough light to work by, you grumble, and all because you have not taken into consideration some of the things not found on blue prints.

* * *

When a cold spell comes along and freezes up your water pipe, the men go home and you go around the shop swearing because you want the work and can't get it, but of course you are innocent, who can blame you, when you never saw a frozen water pipe on a drawing.

* * *

Some of the graceful pictures you make with T square and compasses reminds us strongly of the man who drew up the plans for a double-tracked street railway and allowed but a small space for clearance between passing cars. You will have noticed that on sharp curves such as occur in the streets of a city, it sometimes looks as if you were traveling sideways, a sort of northeast by north, but this man laid down four parallel rails and the first thing he knew two cars attempted to pass each other on a curve and got tangled up. Why should we blame the man, however, when he had never attempted to place the position of the cars in rounding a curve. There are curves to be got over in the plans of any enterprise, and this but illustrates that it is not safe to base your calculations entirely upon the records of a straight track.

Put down all you can on paper and calculate as you will, but if the results of your plans are determined by the actions of humans, you may use four tons of algebra and still get three points out of your course, for you are calculating on some factor to which no set of rules have proven applicable. Put in one corner of your blue print the notice, that it is subject to strikes, riots and the acts of Providence and other causes beyond your control.

* * *

When the final history of your enterprise is written, it will not be the things you had down that caused failure in any part of it, but some of the omitted factors that you as a common piece of humanity could not foresee.

The Scrap Heap.

The Wagner Manufacturing Company, Sidney, O., is one of the best known, largest, and it is said, wealthiest manufacturers of stove hollowware in this or any other country.

* * *

They were a small concern, employing but a fractional part of their present force some few years ago, and seemed content to do a prosperous and growing business.

* * *

Of late years rumor says they have become quite wealthy, and the commercial agencies unite in placing them away up at the head of the class.

* * *

They have exhausted every apparent resource to add to their output and decrease its cost, and incidentally have been able to corner a large amount of the coin of the realm.

* * *

This is all as it should be, and the greater the measure of their success, the more they should be congratulated and are a source of benefit to the town in which they do business, and perhaps to hundreds outside of it.

* * *

But there came a moment when inordinate greed and a selfish indifference of the rights of others caused them to do an un-American and intolerant act that should merit the condemnation of every right-thinking honest man.

During the year 1895 they reduced the wages of their molders, and again reduced them a second time by 15 per cent when they started up after the holiday shut down early in 1896, using the stringency of the times as an excuse, although the competition in their business is nothing like as severe as in some other lines of foundry work, and the number of concerns making hollowware on a large scale, or with the most improved appliances, can be counted on one's fingers.

* * *

It seems that about February 1st, the molders in their employ, either on their own account or as a result of outside urging, began to form a branch of the Molders' Union, and this coming to the ears of the Wagner company caused them some uneasiness.

* * *

Just why it should, of course, we are left to form our own conclusions. If they were sure their employes were receiving as liberal treatment as possible, or as they would receive elsewhere, and had no just grounds for complaint, they could not have had any objection, but, on the contrary, they ought to have felt like favoring the move, thus showing themselves to be in line with the most advanced thought of the day among the leading foundrymen of the country.

* * *

On the contrary, however, they displayed a degree of what might be correctly termed churlishness not to be looked for in this enlightened age.

* * *

One by one their employes were called into the office and asked to sign a formidable document, denying that they either were members of the union, or if members of it, they would withdraw immediately. It was understood that failure to sign meant instant dismissal.

* * *

The State of Ohio, at a recent session of its legislature, passed a law making it a misdemeanor, punishable by fine and imprisonment, for employers to enact such unnatural restriction over their employes, and passed what is known as the Llewellyn law.

The law reads as follows:

AN ACT to protect employes and guarantee their right to belong to labor organizations.

Section 1. Be it enacted by the General Assembly of Ohio, that it shall be unlawful for any individual, or member of any firm, or agent, officer or employee of any company or corporation, to prevent employes from forming, joining and belonging to any lawful labor organization, and any such individual, member, agent, officer or employe that coerces or attempts to coerce employes by discharging or threatening to discharge from their employ, or the employ of any firm, company or corporation, because of their connection with such lawful labor organizations, shall be guilty of a misdemeanor, and upon conviction thereof in any court of competent jurisdiction, shall be fined in any sum not exceeding $100, or imprisoned for not more than six months, or both, in the discretion of the court.

Sec. 2. This shall take effect and be in force from and after its passage.

* * *

THE FOUNDRY is not defending or attempting to defend or take the part of the union, which has oftentimes been guilty of actions equally as reprehensible, but it is inclined to criticise more severely such action on the part of employers whose position enables them to act so inhumanly.

* * *

Such work will every time, whether practiced by employers or employes, eventually react against those who attempt them and do them more harm than good.

Pokey's Pointers.

"No," said Tom Bowers, as he pocketed the proffered cigar, intending it for the cupola tender later on, "I can't give you an order for anything."

"How is that, Tom, ain't our house always treated you square?"

"Well," said Tom, as he scratched away at a bump on his apex, that is developed in all men having to switchback their way across foundry problems, "you have treated me as well as anybody could be expected to be treated from your kind, though you will remember how, on one occasion, you sent me a barrel of East India lead that never saw India, but was made up on Canal street in Chicago. You have played several of your tricks here that you are all the time getting up, but that is forgotten."

"Why can't I have an order then?"

"I will tell you, Mr. Soapstone, how the thing stands. I don't order anything now except my wife's groceries, and I pay for them myself. Mr. Widbur, our superintendent, at present constitutes our purchasing department, and since you have always acted half ways right, and kept away from Pokey, instead of calling him to one side to inform him that you had a facing that would do away with steel brushes and emery wheels, like some of your brothers in business have done, I will give you a pointer as to how you may be enabled to obtain an order.

"Just now," continued Tom, "I am running this shop mainly on samples. When Widbur became the sole purveyor to this establishment, he ordered samples of everything he ran across, a barrel of this and a barrel of that, and some of you fellows coming around here have helped him to keep a stock of samples ahead, and the way it begins to look to me is that you foundry supply men would just as soon give your goods away, as sell them.

"This sampling business is a great deal like a free lunch counter. Many people patronize the latter not because they have any appetite for same, but because they are getting it for nothing, and samples for the foundry are taken for the same reason. Firms are like individuals in this respect, and some of them would get vaccinated, if this was done gratis.

"For my part," Tom went on, "I like to a certain extent to experiment and sample things myself, but there ought to be a limit to this, too. In the first place a concern can't give half of its property away without getting double pay for the other half, and with such an indiscriminate overdose of sampling as I have got on hand, no one is in the end benefited thereby, neither the party furnishing the samples, or the party doing the sampling, are receiving any good therefrom."

"Here I am with seven kinds of plumbago, and have got to be around these barrels all day to see that their contents are furnished to the right floors. I could try one kind at a

time and do so right, but in justice to the manufacturers I must say that I cannot furnish a true and accurate report upon the merits of their wares the way they are at present being used.

"A little sampling goes a long way in the foundry. To try new coke and new iron and run a shop besides that ain't adjusted automatically is a great deal more difficult than most people imagine. A test of any material is worthless unless properly conducted, and every little circumstance entering it is noted. And now, Mr. Soapstone, if you want to give away your wares, step around to Mr. Widbur's office. If he shows an inclination not to patronize you, just roll out one of those long yarns about the brilliancy of your facing, the elasticity of your pig iron and reputation, the number of heat units in your coke, and while you may not be able to sell anything, you will at least have the satisfaction of giving it away and the pleasure of paying the freight to its destination."

"If I intended to start in your business and I was sure there were many men buying goods like Widbur, my first move would be to have some good, first-class advertising done, and have the same plastered thickly throughout with the qualities the goods did not have. There is reason and judgment required in purchasing, as well as in using material. I believe the foundry is entitled to say what shall be used in carrying it on, and not letting this important part be placed in the hands of outsiders."

* * *

"Tom," said the old man the other morning, after he had exploded about six pounds of damp-proof invectives against the Tubal Cain Iron Works for getting ahead of him on a contract, "I see that you have gone into politics."

"How is that?"

"I notice your name appearing in the trade journals with an occasional article."

"Yes," assented Tom.

"Now, Tom, I don't object to you doing that, but I think you might let us have some of your proof-sheets now and then, when we could use them right here to advantage."

"What is it that you want?"

"Well, here is one of your opinions on tracks and turntables in the foundry that strikes me as being just right, and I am going to act on the lines you have laid down here, but I want you to tell me, why you didn't acquaint me with the utility of these things before you took it into your head to put the whole outfit on paper."

"Didn't I do so?"

"Not that I know of, Tom."

"Well, as I have said before, Mr. Pokey, you are getting absent-minded. When I showed you the work it took to run the traveler the whole length of the shop with each casting to get it out of the way, and the length of time some of the molders stood around sucking their thumbs before their work was removed, I suggested that we get a few rails and a couple of trucks to facilitate this. As an antidote against such improvement, you started to tell me how you used to have to do with the three old jib cranes, handling a load from one to another, and that you thought we were lucky in having as good a rigging as we had."

"That is the way we used to do."

"True enough, Mr. Pokey, but whatever we used to do, don't have nothing to do with us now, it is not germane to our present condition at all. That is how there comes to be so many failures in the business world, just because people do like they always used to. It makes them out of date."

"I guess you are right, but if you knew these things you are writing about were money makers, how is it that you didn't come back at me a second time?"

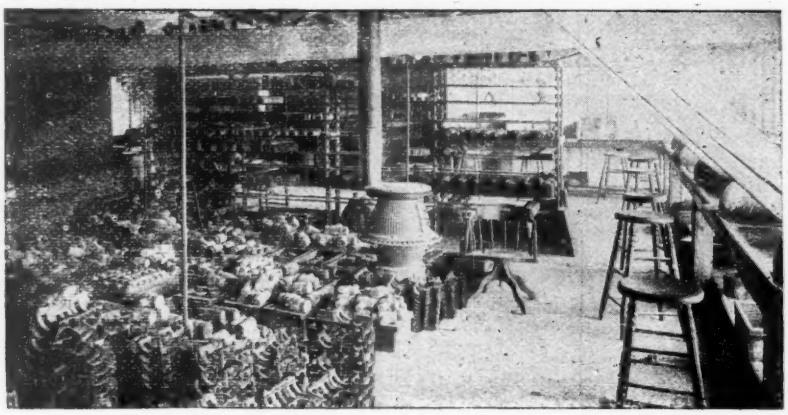
"Because I hate to have to force a good thing upon anybody. Besides, if I should keep on talking about a thing people would say: 'Oh, it is only that old wind-jammer, Tom Bowers, who is tooting his horn. It is no use of paying any attention to him; he has always got something to say, anyhow. So now I put my ideas down in black and white and other people, like yourself, think them over, because they are placed right before them. When they begin to think they look the matter over again and begin to see that possibly there may be something in it. When they listen to Tom Bowers talking, they are not much wiser upon leaving him because their ears are full of prejudice, but with his ideas in print, these can't be shook off so easy."

"You are right, Tom, that is a good pointer. I have never paid much attention to what you

have said, but I will notice what you write. Keep right on, Tom, you are doing well, never mind what people say. Remember, if you don't blow your own horn, nobody else is going to do it for you."

Girls in a Foundry.

While political economists have occasionally dilated upon the extent to which those occupations, commonly supposed to be saved to the sterner sex have of late years been steadily encroached upon by women and girls, yet the number of instances in which female help has been satisfactorily employed in the foundry are so very few that they have never been enlarged upon to any great extent.



Girls' Core Room.

Our illustration gives a good view of a corner of the core room of A. Carpenter & Son's Foundry at Providence, R. I., in which one dozen girls are constantly employed making the smaller kinds of cores used in a foundry, whose product is almost exclusively bench work. It is said that they work steadily and make more and better work than the same number of boys.

We get many valuable pointers from THE FOUNDRY, and we do not see how we could get along without it.

SAVILL & SULLIVAN,
Canton, Ill.

There is much interesting and valuable information in your journal.

CRESCENT FOUNDRY. & CON. CO.,
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CAST IRON NOTES.

Devoted to inquiries from Practical Foundrymen on the subject of Melting and using Cast Iron. Address all Inquiries to W. J. KEEP, care of The Foundry.

How Can a Founder Determine the Value of New Devices and Fluxes which are Recommended to Him.

If an improvement in cupola construction is to be brought to the attention of foundrymen it is generally presented by a man who is a thorough expert in melting. He asks that he may be permitted to make a trial of his device with an agreement that if it works satisfactorily it will be adopted.

The expert at once becomes acquainted with the construction of the cupola as it is, method of charging, irons, fuel, flux, and pressure of blast. He asks for a few seemingly unimportant changes, and often enlarges the tuyere or increases the blast. He also often divides the charges of fuel and iron. If he finds that an excess of fuel has caused slow melting he reduces the fuel charge. If he finds that the bed is too small he increases that, or if the bed is too large and the charges too small he readjusts them. When the day comes for the trial of his improved tuyeres or the new flux, the melt is a perfect success, and the results seem wonderful when compared with former experience. The contract is signed and the price is paid.

The founder has received more than the

worth of his money, and the saving in his foundry product will pay the royalty many times over, and his commendation of the device will make it easy to arrange with other founders.

The fact is, that in ninety-nine cases out of a hundred the new device or flux had nothing to do with the success. If the details of management had been the same the old cupola was all right. The following are a few examples:

The agent of a much advertised cupola proposed to apply his system of upper tuyeres to the cupola of a large St. Louis foundry, and was to receive $500, provided the tuyeres produced the promised saving during a 60 days' trial. The upper tuyeres required a different arrangement of charges, and a different blast pressure, and the variation of quite a number of other details. The results were exactly as promised, the saving would more than pay the contract price. After a few days the superintendent removed the new device, and it was found that the saving was the same without it. At the end of the 60 days the saving was acknowledged, but the money was refused because the tuyeres had been removed after 10 days' use. The saving was due to the skill of the agent and not to the device he had to sell.

It generally pays to hire such a man to come to a foundry and set things straight, because the melter is suspicious of any change suggested by men connected with the works, but will have perfect confidence in a stranger. Here is an example of this. A large foundry had two cupolas melting 30 tons each. The fuel was a little better than one to six, and the melting about seven tons per hour, and the molders wished shorter hours. The melter insisted that if he reduced the fuel he would get dull iron, and he repaired his cupola each day with about five inches thick of brick and fire clay. A German was hired from another city to melt the iron for two weeks for $200. He changed the thickness of the lining from 9 to 4½ inches, to make the cupola hold more iron, and he made a bosh over the tuyeres, making the diameter 44 inches, and 63 inches above. He made the charges smaller and increased the blast from 8 to 14 ounces. He got hot iron and melted 9 pounds of iron to 1 of coke, and 11 tons per hour. The melter, after a few days, said that if the Dutchman could do it, he could do as well. The difference in the production of the foundry more than paid the $200 in a very few months.

Some of the promoters of new fluxes or melting processes propose to work entirely on the imagination of the founder, and convince him that the quality of the iron is improved, or that he can use cheaper grades. They draw attention to the appearance of the iron in the ladle, and the fracture of the casting, and show how much tougher the casting is.

The trouble is, the founder has never happened to notice these things before, and is obliged to accept the claim as true.

To be ready for such men, and for his own good, the founder should have a method of testing that will at all times make him familiar with the shrinkage, strength, deflection, chill and grain of his iron. His daily record should show exactly what he is doing, and when the agent applies he can be shown exactly what is already being one, and he will be told that the influence of his process will be seen at once in the shrinkage and strength, and in the deflection and chill of the test bar. Agents generally prefer not to risk a trial when a founder knows his business.

Here is an example. Two men called and presented testimonials and tests to show the wonderful results of adding a white sand to the cupola charge, claiming that silicon was thus added to the iron during the remelting. It was agreed that this would be a good thing if it could be done, but that it had been supposed that the heat of a cupola was not sufficient to cause iron to absorb silicon, but that the general experience was a loss of silicon during remelting. The men, however, were certain that they could show a great improvement in the castings. They were a little suspicious of the test bar record, and were not sure that they would wish to rely upon the shrinkage to tell whether silicon had been increased or decreased. However, they would come next day, but wanted an agreement that if they should show an improvement, four cents per ton should be paid as royalty for each ton when the sand was added.

They were informed that this could not be granted, because the firm had been using sand with their iron for a great many years. A lawsuit for infringement of patent was

threatened at once, but when it was found that the sand was bought on the pig iron, and that the sprues were charged with the sand on, it was acknowledged that it was the same process, and that no further test was necessary.

To meet such men, the founder should know exactly what he is doing each day, and use a test that would show whether any change will produce an improvement or not.

And he should also try his cupola with and without the new process, with all other conditions exactly the same, to find if the improvement may not be produced by other changes than the one for which pay is asked.

Costs of Castings.

Mr. Editor:

The articles appearing in the September and October numbers of THE FOUNDRY on "Foundry Costs," by A. Sorge, Jr., must surely have been found exceedingly interesting to all foundrymen and very instructive to a great many. The writer was perhaps more than usually interested, owing to the fact that the general plan of the system resembled in so many essentials the one installed by him nearly three years ago in the foundry at which he is at present employed, and is still in daily use.

While it was real pleasure to the writer to note the masterful manner in which Mr. Sorge met all opposition and criticism to his system, still I think it can be readily demonstrated that in one particular—and that a very important one—the system is at fault. It is in the manner of disributing the expense element of the cost, over the different classes of finished product. It is suggested that the expenses be divided into two classes and that one class be proportioned to the weights of castings, while the other be proportioned to the amount of direct labor.

There can be no criticism offered to the division itself, or for the reasons given justifying same.

The fault lies in the act of proportioning a certain amount of the fixed expenses to the different classes as per the amount of direct labor. To demonstrate that this plan is wrong let us illustrate. Suppose two molders, one receiving $3.00 per day and the other $2.50, were given duplicate patterns and both turning out the same amount of work in the same time. I maintain that the product of each man's labor should carry an equal amount of the expenses. The product of the $3.00 man should not be charged with a greater proportion of the expenses, for the simple reason he is receiving more pay. On looking at it from another point of view, you are getting the castings from the $2.50 man cheaper by the amount of difference in wages only, the expense element of the cost remains equal in either case. By Mr. Sorge's plan, however, you would not only be getting the castings cheaper from the $2.50 man to the extent of the difference in wages, but also by a reduced amount of expenses.

Again, suppose under peculiar circumstances you are obliged to give a $3.00 molder a grate bar pattern, molds from which had formerly been made by a certain apprentice at $1.00 a day, and who had become sufficiently expert with this particular grate to get up as many in a given time as the $3.00 man can. The simple fact of getting these grates made at one time by a $3.00 man and at another by a $1.00 boy does not increase or decrease your interest, taxes, insurance, superintendence, clerical help, etc.

For the sake of further illustration, suppose one day you have all $3.00 men in the foundry and the next all $2.00 men. In such an event it is readily seen, in proportioning according to the direct labor, you would be incorporating in the one instance, entirely too much of the expense item in the day's product, and in the other instance you would fall short, while in fact the expenses did not vary one cent.

In ascertaining individual costs, the error is in still greater evidence. It could be possible that it was necessary to ascertain the cost of a certain casting more than once during the same month. Now, if this casting was made by different molders at different rates of wages, then by apportioning the expenses to the amount of labor paid, the cost of this particular casting would vary beyond the actual difference in cost of labor, which should not be.

Again, in estimating on new work, we can readily arrive at the approximate weight of the piece; our foreman can tell us very closely the exact length of time (barring bad luck) it will take to mold this piece, but now how are we able to add the proper amount of the ex-

pense element of the cost to our estimate unless we know just what wages we are going to pay the molder. It may be 60 or 90 days after we made the estimate that we were given the order, and we find that the molder we intended to have make this casting is sick or has quit. Herein it is that the system is weak. There is, however, a simple remedy, a plan in which the amount of direct labor or wages paid is entirely irrelevant.

A. B. FRENIER.

Davenport, Ia.

A Combined Rapping and Lifting Plate and Bar for Wood Patterns.

The advantages of this style of plate and bar are at once apparent to the practical manufacturer and mechanic. They are the result of persistent efforts on the part of the inventor, who has had a wide experience in pattern and foundry work in all its branches, to secure a rapping plate and bar which should be more efficient and durable than anything to be found in the market, and at the same time much cheaper than the old way of making them from pieces of wrought iron.

It will be observed that there are no threads to wear out, and that a quarter turn of the bar secures it in position for both rapping and drawing the pattern. The bars fit the plates snugly at B, while the lifting key at A is loose, thereby rendering it impossible to break off the lifting key or to put any other than a lifting strain upon it. The bars are made doubly heavy above B to withstand the use of the hammer or mallet. The handle slips over a square shoulder on the bar when turning it into position in the plate, but raises and is free to turn and adjust itself to the strain of lifting.

These are made in four sizes, for light or for the very heaviest engine and machinery patterns.

The manufacturers inform us that they are being very widely adopted by heavy machinery builders, and believe their universal adoption is only a matter of sufficient time to introduce them.

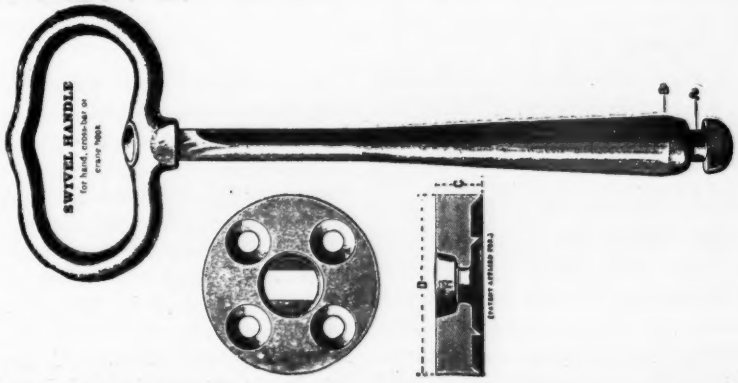
As the above cut is so greatly reduced from actual sizes, for its presentation in our columns, those interested should address the manufacturers, W. S. Hawker & Co., of Dayton, O., for circulars showing full-sized plates and bars and price list.

A Combined Hoist and Drop.

How to improve on the economical handling of materials is the one great study of manufacturers everywhere, and is almost wholly responsible for the greatly reduced cost of production to be seen on every side, and affecting nearly everything we use.

One phase of this question that troubles foundrymen frequently has been the rapid and convenient handling of outside work, such as heavy wooden or iron flasks, the loading and unloading of castings or heavy pieces of scrap, the equally important problems connected with the breaking up by means of the "drop" of large and irregular shaped castings.

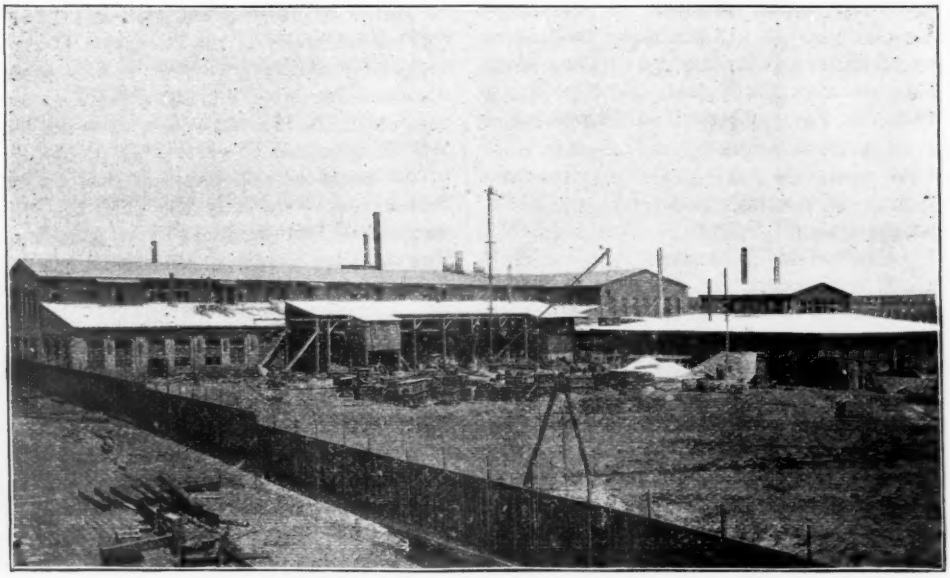
Probably no concern in America or, indeed, in the world, has established a better or more wide-spread reputation for themselves as manufacturers of certain descriptions of hoisting machinery than the American Hoist



& Derrick Company, of St. Paul. They have not divided their energies by endeavoring to make anything or everything in the way of cranes, elevators or hoisting apparatus, but they have consistently kept to one thing, and as a result their cranes for outdoor work are to be found in all parts of the world. The one shown in our illustration was erected by them for the foundry of Henry R. Worthington, Elizabethport, N. J., and no greater compliment could have been paid them than to have had their crane selected by that well-known establishment for the purposes for which it was intended. It is what is known as the "all-steel" "tubular" style, and can be readily erected and operated anywhere by either hand or power. The Worthington derrick is operated by an electric hoist. It possesses the great advantage, also, of being easily equipped to do service as a "drop" by merely fastening to the hook of the crane the clutch used to pick up and lift the weight until released either automatically or by the operator.

The derrick shown is made of steel throughout, and so trussed as to be very strong. The materials used in its construction are such as to insure the greatest possible degree of safety, durability and freedom from repairs.

These hoists have been installed at several foundry plants in different sections of the country, and are said to give the very best of satisfaction.



A Combined Hoist and Drop at Foundry of Henry R. Worthington.

Obituary.

AMBROSE PLAMONDON.

Ambrose Plamondon, president of the A. Plamondon Mfg. Company, Chicago, died in that city on the 19th ult., aged 62 years. He had been a resident of Chicago for nearly 40 years, and during the whole of that time was prominently connected with the city's manufacturing interests. He was born in Quebec, Canada, December 31, 1833. His parents removed to Oswego, N. Y., while he was very young, and there he was educated. He began the battle of life early, was married before he was 20, and at the age of 22 erected extensive starch works, which he afterward superintended for some time. Being called upon to erect industrial plants in Northern Illinois, he located at Chicago, and embarked in business shortly after the panic of 1857. The firm was styled Plamondon & Palmer. Subsequently he purchased the interest of his partner and then formed the A. Plamondon Mfg. Company in 1864, building a foun-

dry and machine shop at their present location, 57 to 67 South Clinton street. The business grew and successive enlargements were made, so that the plant has for years been one of the most extensive in the city in its line, making a speciality of pulleys, hangers and shafting. He was interested in a number of manufacturing enterprises outside of the iron line, and was a director of the Fort Dearborn National Bank. A man of generous impulses, he was exceedingly liberal in his benefactions, and is sincerely mourned by the poor, whose distress he was ever ready to alleviate.

EDWARD B. HOLMES.

Edward Barber Holmes, the pioneer of the Chicago architectural iron industry, died in that city on the 20th inst., aged 67 years. He had been a resident of Chicago for over 50 years. Born at Chittenango, Madison County, N. Y., he was raised upon his father's farm until 13 years of age, when his father died, after which the lad was thrown upon the world. Engaging in any occupation that presented an opportunity, he worked his way to Racine, Wis., but in 1845 located in Chicago, and eventually secured employment in the Gates Iron Works as a molder. Here he became acquainted with James W. Pyott, a brother molder, and a few years later from that acquaintanceship sprung the firm of Holmes, Pyott & Co., still in existence, and prominent in the architectural iron trade. Their foundry was at first operated almost exclusively on railroad work, but in 1865, when the plant at Jefferson and Lake streets was built, the attention of the firm was directed to the artistic features of iron molding as involved in architectural work. He leaves a widow and four children, of whom Harvey A. and Oliver W. are members of the firm.

JOHN T. ROCKAFELLOW.

At Maywood, near Chicago, Ill., on the 20th inst., John T. Rockafellow died, aged 58 years. He was an old Chicago foundryman, who was born February 1, 1838, in Livingston County, N. Y., learned the molder's trade, and, in 1870, removed to Chicago. He built a foundry for John J. McArthur, which he managed for several years, and afterward became connected with the Crane Bros. Mfg. Company, now the Crane Company. In 1878 he built the Maywood foundry, of which he was proprietor at the time of his death. He was a public spirited citizen, liberal in his charities and favored with a wide circle of friends. His wife and one daughter survive him.

WILLIAM P. DARLING.

William P. Darling, manager of the steel foundry of the General Electric Company, at Lynn, Mass., died suddenly in that city on February 18, in his 49th year. Mr. Darling was a native of Cayuga County, N. Y., and for 20 years managed the Pratt & Letchworth works at Buffalo, N. Y., going from there to Lynn four years ago.

H. A. Massey, Canada's great reaper manufacturer, died at his home in Toronto February 20th, in his 73d year. He was a farmer's son, and started with his father in a very small foundry at Newcastle, Ont., afterwards becoming the head of the large corporation that absorbed several of the leading reaper manufacturers of the country.

Nicholas Wemple, a prominent citizen of Fultonville, N. Y., and for thirty years engaged in the foundry business, twenty-five of them as a member of the firm of William B. Wemple & Sons, died at his home there February 19th, aged 61.

New Foundry Enterprises.

The Gibson Foundry & Machine Co. is a new concern at St. Johns, N. B.

Wm. Wright will erect a brick foundry building in Waukegan, Ill.

Cooper Bros., Cortland, N. Y., will rebuild their foundry, burned some months ago.

J. R. Coates, of Tulare, Cal., will erect a foundry and machine shop at Visalia, Cal.

Wm. Mendon, of Kalamazoo, is likely to engage in the foundry business at Mendon, Mich.

The Maine Electrical Construction Co. is the name of a new foundry at Fairfield, Maine.

The foundry of the new Hassell Iron Works at Colorado Springs, Colo., will be a brick building, 52x60 feet.

Meehan & Son, of Covington, Ky., have purchased from J. A. Robertson a large iron foundry and machine shop at Monterey, Mo. These works have been doing a most excel-

lent business, and it is expected that the new owners will make them one of the largest concerns in that part of the country.

Among the Foundries.

Henry Feeley has purchased a half interest in the Eagle Foundry at Linden, Mich.

The Radford Pipe & Foundry Company of Lynchburg, Va., is to be sold on March 20.

There is some talk of Carroll Bros. removing their foundry form Hancock, Mich., to Houghton, Mich.

There is a good prospect that the George P. Sennett Foundry Co., of Meadville, Pa., will remove to Youngstown, Ohio.

The American Bell Foundry at Northville, Mich., is casting a new 2,000 pound bell for shipment to India. It is their second to that far-off country.

The Anniston Pipe & Foundry Co. has purchased the pipe foundry it has been operating for the past thre years at Armiston, and will make extensive enlargements and improvements.

J. G. Miller's new foundry at Chatham, N. B., was started up February 6th. Inasmuch as the old plant known as the Gillespie Foundry was burned in October last, and an entirely new set of buildings were erected on a different site, it can be regarded as fast work for such cold weather.

Fire Fiend.

The New Ulm Foundry, at New Ulm, Minn., was burned March 8. Loss, $3,000.

The Somerset Stove Co.'s foundry at Somerset, Mass., was destroyed by fire February 12. Loss, $25,000.

A. Mampel & Sons' foundry at Bath, Maine, was destroyed by fire February 17. Loss, $2,000.

The foundry of Kurtz & Buhrer, Chicago, Ill., was totally destroyed by fire February 25. Loss, $80,000.

Books, Exchanges, Catalogues, &c.

J. N. Paxson & Co. are sending to their friends a mammoth postal card, intended principally to advertise what they call "Mica Shirt," a substitute for fire-brick, and which they claim burns hard under heat, and does not expand or fall out. It can easily be broken to small size.

"Modern Progress" is the title of a new candidate for popular favor in the way of a mechanical monthly magazine, published in Erie, Pa. It is primarily designed, evidently, as a sort of review of the progress being made in the mechanical and engineering fields of the world.

Notice.

Advertisements Entitled Situations Wanted, or Situations Vacant Will be inserted in this column one insertion FREE All others 25 cents per line.

WANTED—A man that thoroughly understands melting steel. Address JOHN PAUL, box 458, Newport, Vt.

WANTED—Position as foreman; 20 years' experience on machinery and jobbing. Address C, box 11, care THE FOUNDRY.

WANTED—Position as foreman of stove foundry. Understands the business thoroughly, and can give best of references. Address box 10, care THE FOUNDRY.

WANTED—Foreman for large malleable iron foundry; experienced in all departments and details, including mixing and molding. Address, stating qualifications and salary asked, C, box 8, care THE FOUNDRY.

WANTED—Position as foreman; 20 years' experience on chilled rolls, dry sand, heavy and light green sand. Thoroughly understands the melting and mixing of iron for all kinds of work. Good references given. Address A. J. K., box 6, care THE FOUNDRY.

WANTED—Position as foundry superintendent or as foreman; 16 years' experience, 8 as superintendent; well versed in modern foundry practice; will work on salary or take shop on tonnage basis; can introduce accurate cost system. J., Station A, Detroit, Mich.

FOUNDRY SITE FOR SALE—Parties who are interested in having a good foundry located near them, on account of using a large amount of castings, are offering suitable size ground for same with railroad frontage and affording the best facilities for receiving iron, coke, sand, etc., in carlots. This is an opportunity that will bear investigation by anyone contemplating the

starting of a foundry or changing their location. For particulars address this office, box No. 7, care THE FOUNDRY.

FOR SALE—At a bargain, heavy geared Rattle Box; never used; 28x50 in. inside; is complete with countershaft and 24x6 in. T. & L. pulley; all in heavy iron frame; modern machine. W. A. JONES FOUNDRY & MACHINE CO., 57 So. Jefferson St., Chicago.

King's Sand Blast.

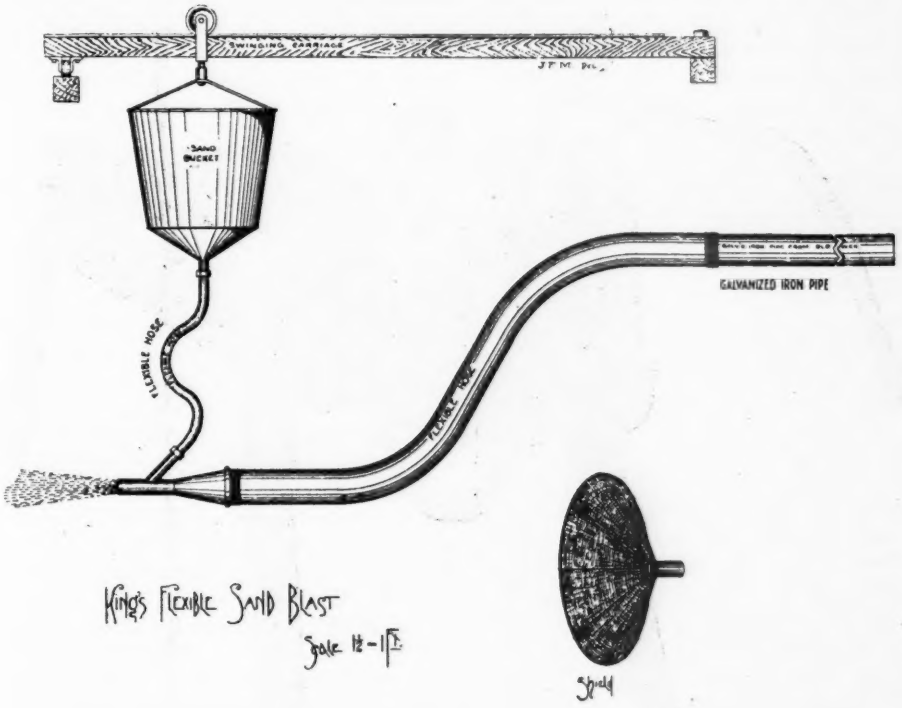
The value of an efficient sand blast for casting, cleaning purposes, where the character of the work is such as to enable its being used efficiently is something that in these days needs not to be enlarged upon. The economy of that method and the superior quality of the work done all speak for themselves.

Hitherto the expense of installing a sand blast has been the main obstacle that has prevented its almost universal use, although the complication of methods offered have also had much to prevent its more general adoption.

All of these objections are, however, it is said, largely overcome by the improvements presented by F. W. King, of Detroit, and incorporated in the apparatus put upon the market under the name of King's Patent Sand Blast.

As will be seen by our illustration, the outfit is exceedingly simple and without any parts liable to get out of order. It consists mainly of a large reservoir or hopper to hold the dry sharp sand used with a flexible rubber tube leading from it to the pipe that carries the blast, and forming a junction with it just at the nozzle and before its delivery.

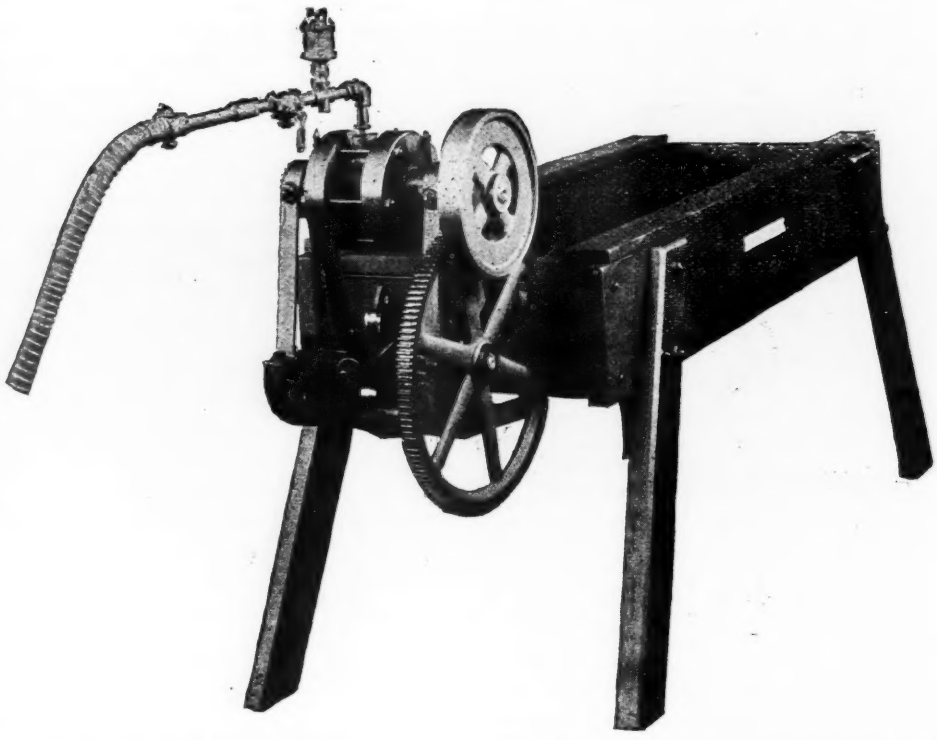
The blast can be furnished in the usual way, through an air-tight hose, leading from a small-sized fan, conveniently located.



For cleaning large-sized iron or steel castings, or those too large to economically put in tumbling barrel, it is doubtful if anything approaches the sand blast, while it is claimed that in the case of stove plate that it is intended to nickle, the sand blast prepares the castings direct from the bath. Work that it is intended to polish can be prepared for the bath by the use of the No.

120 emery wheel after being cleaned in this way, while it ordinarily requires to be cleaned on the Nos. 60, 90 and 120. The economy of this latter item alone must be apparent to the stove men, who are compelled to ordinarily pickle the castings that have to be nickled without polishing, while those that are to be polished have to be "roughed out" ordinarily on at least two emery wheels before going into the nickle bath.

F. A. Goodrich & Company, Detroit, are the sole agents, and report that it has met with a very ready sale since placed on the market.



Pneumatic Sand Sifter.

Between electricity and compressed air, old time power systems appear to be destined to a severe shock in the near future.

One of the latest innovations in the foundry line is in the shape of a pneumatic sand sifter, shown in our illustration, and for which great things are claimed. It consists of a heavy oak frame, containing a swinging riddle, which can be lifted out by hand at any time, without touching any other part whenever it is desired to insert another of a coarser grade. The motive power is a substantial, balanced and efficient rotary motor which drives the gear connected to the three-pointed knocker attached to the sieve. The amount of air required to operate the machine is very little as with the air being admitted through an opening one-eighth of an inch in diameter, under pressure of seventy pounds, sufficient power is developed to do the heaviest work. Speed is governed by the amount valve is opened, and any speed desired can be obtained immediately at the will of the attendant. The machine is portable and can be placed wherever air connection is handy.

The first one of these machines to be set in operation was placed in the foundry of the Abrams Cook Stove Co., at Philadelphia, where it is said to have given a degree of satisfaction in excess of anything that had been anticipated.

For many reasons compressed air offers many advantages as a motive power in iron foundries where the duty required is not too heavy and this seems to be one of them.

This machine is designed and placed on the market by C. H. Haeseler & Co., 1001 Hamilton street, Philadelphia, Pa., who has made a specialty of pneumatic appliances and pneumatic pressure for foundry purposes.

Questions and Answers.

In the years ranging from 1861 to 1865 our foundry turned out many and various bronze and brass castings, of different compositions, weighing from 3,500 pounds to 10 tons each.

The bronze or brass, in every case, was melted in a cupola furnace, or, to speak more correctly, the copper was so melted and the other metals making up the composition were added in the ladle after tapping. We charged amout one-third more copper on the bed than our usual practice with iron. We started the blast with six-ounce pressure and reduced it to four-ounce pressure, when the copper had started melting. The fuel used was Anthracite coal. We were particular to measure the ladle carefully, to estimate the contents of melted copper, in order to add only the amounts of tin or zinc, or both, needed to make the composition desired.

The above statement covers, fully, our practice during the time mentioned, and we have occasionally repeated the operation since those years.

This information is only intended to answer your inquiry, literally, and I do not wish it to be understood that I would recommend its adoption, if recourse, in any case, could be had to crucible furnaces. We used the cupola furnace then and since, for the reason that we were not supplied with sufficient crucible furnaces to melt the amount of metal desired. Should we have the same work, at the present time, we would melt the metal in crucibles, as we are now provided with enough furnaces to melt any amount of metal likely to be required, and also because we have learned from experience, that in order to obtain the most uniform and economical results, crucibles should be used in preference to either the cupola or reverberatory furance. Still, in cases where a large casting is occasionally required and enough crucible furnaces are not available, I would certainly advise the use of the cupola, as above stated.

D. J. MATLACK,
Treas. Parsons Manganese Bronze & Copper Co., Philadelphia, Pa.

Reply to the question in a previous number would say that the melting of brass in cupolas, where the work produced is finished, has never met with much success, the castings almost always are unsound, either being filled with blow holes or showing a general scuffy appearance when the surface is turned off. This fact I have always attributed to the metal coming in contact with the impurities in the fuel, assisted by the blast action. That it is not good practice, we have but to think of the tonnage of brass melted every day in crucibles, that could be done so much cheaper and quicker in cupolas if good results could be attained.

At different times in my experience, I have been forced to melt brass in a cupola and in some cases with fairly good results, but in most of these cases the castings were wanted more for strength than finish. I call to mind one place that they manufactured water-wheels quite extensively, and all the buckets for same were cast from a cupola of small diameter made especially for this purpose. This was a case where strength of material and not finish was required. This was before steel, and malleable castings were not so attainable as at the present time. I have also made many brass or bronze castings, requiring both finish and pressure test, successfully from a cupola, but this was only resorted to when the weight of casting was far beyond the capacity of the regular brass furnace and crucibles of the works. In using the cupola for making brass, I have always obtained the best results by melting the copper only in the cupola, adding tin and zinc in the necessary proportions in a fluid state when copper was tapped into the ladle.

As in melting iron, the amount melted on bed, and subsequent charges will have to be regulated according to size of cupola, and best results can be obtained by using about one-third more fuel than is used in melting iron, with from a two to four-ounce blast pressure.

W. F.

James Chalmers.

The History of a Tramp Molder.

W. EDWARD.

CHAPTER XXV.

I went up to Memphis on a Sunday excursion, and ran across two or three of the boys down at Jackson Park, who informed me that there was plenty of work in all three of the shops, and if I wanted a job all I had to do was to ask for it. So the next

morning I went down to the Chickasaw, struck Johnny Highams for a job and was told to come out in the morning. I had been working so steady for the past two months that I wanted to relax a little, and I was not particular whether I went to work at once or not; but they were rushed with work and I promised to show up next morning sure. That afternoon I run across Dave Perey and another fellow, who had laid off to have a little sport, and I went out to see the town with them. We started out to Fort Pickering to see John Enright, who was running the Milburn shop, but we stopped so often on the road that the boys had all poured off and gone home before we got there, and we each had a pretty fair "jag" on. We whooped it up pretty lively from Monday night until Wednesday afternoon, when the boys managed to get me back to the Cochran hotel and put me to bed. I got a good sleep and managed to brace up enough to go to work next morning, although I wasn't sure that there would be any use in going out when I failed to show up on Tuesday. However, Highams never said a word to me, but he gave me a job which nearly broke my back for the next three or four days carrying iron, and I guess this was the way he took to get even.

While I was down in Mississippi I had got filled up with malaria, and before I was in Memphis a week I began to have chills and fever. I loafed so much that Highams growled about it, and I got mad and quit. I didn't do anything for three or four days, and then I went over to the scale shop, where I heard they wanted a man to take charge. The fellow who run the place wanted me to run the shop, make the brass, run the cupola and take the responsibility of the whole place for three dollars a day; but, as I could make that or more on the floor in either of the other shops, I wouldn't take it. Then I went over to Livermore's and struck a job with Sam Howles, but Sam and I couldn't hit it very well and I only stayed a couple of weeks. I guess Sam meant all right,but he had some peculiar ways with him that kind of goes against a fellow's grain, like rubbing the hair of a cat the wrong way. One day he gave me a small coupling to make and told me to put a 2½-inch core in it. After I rammed it up I sent my helper after a core, but there was none in stock and they would have to make one, so I left the flask open and went on with my work, telling the helper to get the core as soon as it was dried and cut it to fit the pattern. Bye and bye the open flask was in my way, so I closed it up without the core and poured it without giving it another thought. It happened that they wanted the coupling, and a helper was sent for it, who carried it into the machine shop. The foreman of the machine shop sent for Sam and showed him the coupling with the print cast on it. Then Sam came to the door of the foundry and bellowed out loud enough for every man in the shop to hear: "Hi, Jim, what in —— do you call this?" I didn't know what was up, because the helper had taken out the castings, so I followed him into the machine shop. Then, before all the machinists, he wanted to know what kind of a molder I was that didn't know the difference between a core-print and a boss. To be called out in front of all the men in the shop and be made a fool of by the foreman is most humiliating, and I was tempted to retort or to swipe him over the head with the shovel which I carried in my hand, but I restrained myself, because I knew I couldn't say enough to do justice to my feelings. I walked back to my floor, shook out two flasks I had rammed up, put my tools in my pocket and walked out of the shop. The next day was pay day and I knew I could get my money without asking Sam for it.

When I quit Livermore's I concluded I would strike for St. Louis, and intended to take a boat and travel in style, but the water was low and there was only one small boat running to St. Louis, so I thought I would make just as good time and be about as comfortable if I went by freight. I had about $40 which I had saved in Corinth, having spent my money as fast as I made it in Memphis, and I was pretty well fixed for clothes. As I always do when I am on the road and have more than one suit, I packed my clothes in a grip and sent it on by express ahead of me, and it was very fortunate for me that I did so on this occasion. After having a farewell drink with several of the boys I crossed on the ferry into Arkansas and lay for a train on the K. C. & Gulf. I caught a train without any trouble that night and got to Hoxie, where this road crosses the Iron Mountain, about daylight the next morning. Just as we slowed up at the junction I saw a Mountain train pulling out, and I could see that there were plenty of empty boxes on it, so I cut across the fields and caught it before it got under good headway. I was running alongside an empty box trying to find a hand hold, when a man reached down, grabbed me by the arm and pulled me into the car. I looked around as soon as I scrambled to my feet and saw that there were two others beside the man who had pulled me in, and a pretty tough looking crowd. They were professional tramps who made no pretense of working, and there was hardly a town in the country in which one or the other had not been. I thought I was safe enough so long as it was daylight, but I wouldn't have considered myself very safe in their company after dark, and I concluded to part company with them as soon as we got to Poplar Bluff.

(To be Continued.)

Telegraphic Cipher Code.

Something unique as well as useful in the way of a cipher code has just been introduced by the Diamond Clamp & Flask Co., of Richmond, Ind., for ordering snap flasks. When a flask is needed, the molder determines the required measurements, then refers to the code (neatly printed on a heavy card), runs down the list, quickly finds the desired size, for instance, 10x12", which is designated by the single word "Ben." Then for the drag and cope, say 4" and 5½" cope, he finds "Johnston." He sends in his order for one "Ben Johnston," two words being sufficient for fully describing one flask.

After closely watching the point, this firm states that many foundrymen prefer, even when writing, to state their wants by means of a code, as these supplies are to the stenographer and other employes in the office usually as "Greek" and liable to get "mixed;" but a common name as George Knox, Ruth Taylor, etc., is as clear as daylight. The real purpose of the ciphers, however, is to create a saving of expense in ordering by telegraph, as it will be readily seen that three different flasks, with directions for shipment, can be ordered with ten words. The code is furnished to anyone desiring it.

The Foundry Foreman.

By H. R. RAMP.

Foundry foremen, as a class, are men who should always receive their employers' heartiest assistance and sympathy. As a rule, they are underpaid mechanics, taking into consideration the responsibility they assume and the amount of knowledge they are supposed to possess. They are often men who have risen from the floor under favorable circumstances, or a greater display of executive ability than their comrades, or are possessed of greater powers as linguists, being able to persuade their employers, if they were running things, the place would be a success. Among them we also find men who make the success of their business the sole object of their life, who constantly study it in all its departments and phases, every new improvement receives their attention, every blemish or fault in their work consumes part of their time to remove the cause or apply a remedy. They push forward constantly to stand at the head of their business, to accomplish what they do, cheaper and better than anyone else, as far as possible. Yet these same men are put on the same basis with the smooth-talking fellow or the foreman who holds his position through suffrage or the inability of the firm to properly fill his place, as far as salary is concerned.

Men are employed as foundry foremen in most cases at salaries ranging from $75 to $100 per month to handle and run a foundry making from five to twenty tons of castings daily, and employing from twenty to one hundred men. A good molder will receive $3 per day in most localities, and he is only responsible for his own labor and production, yet his foreman may only receive fifty or seventy-five cents a day more than he and be responsible for the labor of fifty or a hundred men.

Will $3.50 or $4 per day buy the information of a man who is capable of performing all the duties that will devolve upon him in a proper and economical manner? Is it a brilliant or promising prospect for the energetic and enterprising mechanic, when he sees other professions and trades where ability is more warmly appreciated? First, he must be a man in every sense of the word; he must command the respect and admiration of his men and the confidence of his employer; he must study human nature sufficiently to enable him to understand the best method of handling the different men and dispositions under his control intelligently. Respect for their feelings, a little attention to their individuality, and a considerate rather than a dictatorial policy adopted. The foreman who is constantly changing men, constantly driving out the old and replacing with the new, is never a thorough success to his employer, for molders and mankind are much the same the world over.

Next, he must be possessed of firmness; no little selfish feelings, no soft heart or desire to please his men, can permit him to neglect his employer's interest, for that is the guiding star he must ever hold before him in his actions and business. The familiarity or flattery of some, or the unreliable stories of others, must not influence him to allow the rules of the establishment to be violated, either as regards the quality or quantity of a day's work.

Next, his mechanical ability must be unquestioned. He must have had practical experience himself, and be thoroughly compe-

tent to perform as well as instruct his best mechanics in a lucid and intelligent manner, how the most intricate and difficult casting should be made, and stand ready to accept the blame if his direections are faithfully carried out. He must be a coremaker and thoroughly understand this oft-neglected part of the business; ready and able to correct errors there, and in a successful manner. The cupola and its manipulations, charging, mixing of iron and its economical operation and all that pertains to it must be his constant study. He must learn how to melt 10 to 1 or 12 to 1, as the case may be, the same as his employer's competitors, or show just reason why. Some knowledge of chemistry is essential also. He must be able to intelligently construct his rigging, flasks and facilities for the rapid and economical production of work, and who but the foundry foreman should be competent to correctly judge concerning the best facilities to put in a foundry? The supplies, blackings, facings, and all such things are in a measure subject to his approval and judgment.

Lastly, he should be a manager. He should know before entering the shop in the morning what he was going to place every man at, and what work he expects to accomplish by night, and in what manner.

Can such men be obtained for fifty or seventy-five cents a day more than a good molder receives? And if they do, are they receiving their just reward? The foundry foreman stands between his employer and his men. On one hand he receives blame, complaints, and requests to stimulate his output; on the other he meets dissatisfaction, petty complaints, and is looked upon as a tyrant in the hands of a company. His duties are not pleasant or easy. Never a day passes but that something is done wrong —something comes up to mar the pleasure of all the good he has accomplished. Seldom does he hear of a good job done, a good casting made, or a good appliance constructed, from his employer, unless it is in some other shop and built or accomplished by some other man. I do not assume that employers are dumb to their merit, but too seldom do they drop a word of true appreciation, or an increase in salary, unless compelled to. There are good molders in our foundries to-day who will not accept a foremanship for the sole reason that they know what it entails, and how little return they would get for accepting the additional responsibility.

THE WESTERN FOUNDRYMAN'S ASSOCIATION.

The Western Foundrymen's Association held their March meeting at the Great Northern Hotel on the evening of March 18. The undiscussed questions remaining on the list proposed by the Edeting Committee Committeee some time ago is as follows, and they will probably be taken up in the order named:

Is it desirable to have a recognized appreticeship, and, if so, what is the best form?

Are foundries generally noticing an irregularity in the grading of foundry pig iron? If so, does this irregularity exist more generally in northern than in southern irons? Does it apply to both charcoal and coke irons, and in your opinion is any of the difficulty traceable to an extreme desire on the part of furnaces to supply their Bessemer pig iron trade at the expense of their foundry trade?

In your experience, what is the most efficient method of cleaning light castings?

What is the proper temperature at which to bake cores? What method do you use for determining this temperature?

What is the proper amount of air, and pressure of same, to melt iron in a cupola, and what are the effects of too little and too much air?

Is it economical to ventilate a foundry artifically? What has been your experience?

What is the best method of lighting a foundry of modern design?

Pittsburgh and Vicinity.

Business improvement during the past week has progressed slowly, but the tendency has been in the right direction. Trade in iron and steel circles has been of a moderate volume and the total sales of the month just closed show considerable increase.

There is plenty of competition for orders of any size for prompt delivery, but the general prices have not changed any. The production is very large and, while the current demand is rather disappointing, many think that the situation is favorable for a good spring business.

Some of the foundries are still running short time and are said to be cutting prices in order to secure business. There is, it may be said, a disposition on the part of some to buy in certain lines. Large consumers of foundry irons have placed several good-sized

orders for material lately, and reports are that other orders will soon be placed.

It is difficult to see what consumers of foundry iron expect to gain by the delay in placing orders, as there is little chance of lower prices and many chances in the opposite direction. Cost of coke, ores and transportation are all higher, and certain to remain so almost under any conditions, while if there should be, as fully expected, an increease in demand and active buying, prices would respond with surprising promptness.

Prices in the eastern portion of Pennsylvania rule about the same as in this section, while reports from the west are favorable for better figuresThe rates given below are about the same as those quoted last month, and are as follows:

No. 1 Foundry	$13 25@13 50
No. 2 Foundry	12 50@12 75
Charcoal, Foundry No. 1	17 50@17 75
Charcoal, Foundry No. 2	17 00@17 25

Cast Iron Pipe.—Plants are being kept running steadily and the prospects are very encouraging for a good spring trade. The present demand is very good and prices are being firmly held.

Castings.—Several large contracts have been placed for roll equipments, etc., in this vicinity, and business seems to be slightly on the mend. Prices are as follows: Chilled rolls, up to 12 in. diameter, 3¾c per lb.; chilled rolls, over 12 in. diameter, 3¼c per lb.; sand and homogenous steel rolls and pinions up to 12 in. diameter, 2¾c per lb.; over 12 in. diameter, 2½c per lb.; V-tooth pinions, ¼c per lb. additional; housen and rolling mill castings not other wise specified, 2c per lb.; spindles and coupling boxes, 1¾c per lb.; squeezer castings, 2¼c per lb.; squeezer pinions and wheels, 2½c per lb.; spur and bevel wheels, large, 4c per lb.; spur and bevel wheels, small, 3c to 2¼c per lb.

Pig Tin.—The market is flat at this writing and but little business is being done. What little is being done is at 15¼@15¾ cents.

Copper.—Conditions in this market change nearly every week, and at this time there is a brisk demand with fair prices prevailing. The rate quoted is 11¼ cents.

Pig Lead.—The demand has weakened slightly, but prices are holding firm at about $3.30@3.35 for carload lots, and $3.30@3.35 smaller quantities.

Aluminum.—There does not seem to be much let up in the demand for this material, as orders of a large size are coming in daily. During the past few days orders were received for an amount of good size to be shipped to France. Prices are stationary at 60 cents for the No. 1 aluminum, 90 per cent pure and in rolling ingots, and in ingots for re-melting, 55 cents.

Notes.

The force of molders employed at the car wheel foundry plant of McVay & Walker, at Braddock, has been reduced, owing to lack of orders, but the plumbers' ironware department is running at full capacity on a full line of enameled iron, bath tubs, sinks, hoppers, etc., the orders for which will keep the plant busy for the next 90 days. This plant is being improved by the addition of a two-story warehouse and an electric light plant.

The Poultney Foundry & Engineering Works, of Youngstown, has been granted papers of incorporation. The capital stock is placed at $50,000. The firm manufactures hydraulic machinery, blowing eengines and the celebrated Poultney valve.

The Pittsburg Architectural Iron Works, at Ganonsburg, which was erected about a year ago and put in operation for a time, has been sold to the U. Baird Machinery Co., of Pittsburg.

The Shenango Machine Co., Sharon, manufacturer of bronze coolers and tuyers and furnace work specialties, has its plant running regularly and has sufficient work on hand to run for several months to come.

The stockholders of the J. P. Witherow Co., of New Castle, held a meeting a few days ago in Pittsburg and elected the following directors: H. M. Atwood, Isaac Reese, George Best, John Q. Denney and James P. Witherow. Mr. Isaac Reese was afterward elected president and Mr. John Nicholson secretary. The report shows the company to be in excellent financial shape, with work enough ahead to assure another prosperous year.

The Forsythe Pattern Co., of Youngstown, O., is now at work on the patterns for the two gigantic 5,000,000-gallon pumps for the water works of that city, and which will be manufactured by William Tod & Co.

The Totten & Hogg Iron & Steel Foundry Co., of Pittsburg, is now at work on a pair of reversing engines and a special train of rolls which it is building for the Ironton Structural Steel Co., of Duluth, Minn.

The foundry operated by E. W. Bailey, at Sharpsville, Pa., was totally destroyed by fire on the 24th ult., causing a loss of nearly $5,000. It was 40x60 feet, and well equipped. The machine shop adjoining was not destroyed.

J. W. Morrison, Jr., has again taken charge of the iron department of the Morrison Foundry & Machine Works, at Youngstown, Messrs. McCurdy & Miller having gone out of the business. He is making extensive changes, putting in a large new crane, large core oven, and other improvements for making large iron and brass castings.

The Warren, O., Casting Works will be moved to Youngstown and will soon be in operation. The product will be light castings. Among other specialties which will be manufactured are fire escapes.

Wm. Tod & Co., of Youngstown, O., have an order for one blowing engine for the Ohio Iron & Steel Co., Lowellsville, O., and two for the Andrews & Hitchcock Iron Co., of Youngstown, all 42x84x60. Also two 5,000,000-gallon cross compound pumping engines for the city of Youngstown.

Manufacture of Aluminum Brass and Bronze.

The manufacture of aluminum bronze is a subject which is gradually becoming more and more interesting to manufacturers and consumers, brought about by the reduction in the price of aluminum from time to time; and also as the general knowledge, adaptability and usefulness of aluminum bronze becomes known. It is no exaggeration to say that it is the strongest known metal. Some tests of ten per cent. aluminum bronze sheet, one-quarter of an inch thick, have been made, giving an ultimate tensile strength of from one hundred and three thousand to one hundred and seven thousand pounds, when tested in sections cut from the finished plate of the above thickness. Aluminum bronze is also noted as having a remarkable amount of ductility as compared with its ultimate tensile strength.

Aluminum brass and bronze vary in the amount of aluminum contained therein, all the way from one-tenth of one per cent. in aluminum brass to ten per cent in aluminum bronze. Nearly all these alloys, both of alumium brass and aluminum bronze, can be worked as steel is worked, having for its advantage a greater combined strength in comparison to its ductility. Another factor which is drawing attention to aluminum brass and aluminum bronze is its power to withstand corrosion, in comparison with other metals, especially the ordinary brass and bronze. The presence of silicon in aluminum bronze gives you a harder and more brittle metal, and of less ductility, and not as malleable a metal as though the silicon were not present. The presence of iron detracts from the strength, and very seriously interferes with the presence of bronze.

Aluminum in bronze lowers the melting point from one hundred to two hundred degrees. The melting point of ten per cent. aluminum bronze being about seventeen hundred (1700) degrees Fahrenheit; whereas the melting point of the ordinary bronze is from 1900 to 1950 degrees.

All the aluminum brasses, as well as the bronzes, harden very materially when worked cold. This hardness can be reduced, however, by annealing, or in other words, heating to a red heat and then plunging into cold water. Aluminum bronze, as well as aluminum brass, works freely in the lathe, and does not clog the tool. The higher percentages of aluminum bronze has special anti-friction qualities, owing to its very compact texture, and smooth, hard surface, which resists abrasion by friction to a remarkable degree. Sound castings can be made from either aluminum brass or aluminum bronze, if the proper precautions—some of which will be described hereafter—are taken, which must be carefully noted.

First, taking up the question of aluminum brass, aluminum is used in brass for two purposes. First, in very small quantities to make it flow freely and run to the most distant part of the mold, which is practically desirable in making castings from a gated pattern, especially if the patterns are small. In this case you do not want to add more than from one-tenth of one per cent. of aluminum, to twenty-five hundredths of one per cent. of alumium, or in other words, from two to five pounds of aluminum per ton of brass. The use of this amount of aluminum also gives you a sound and more prefect casting, as previously stated.

Some objection has been raised to the use of aluminum in brass, for the reason that it makes the surface of brass dark, and of not a good appearance. This is only so when a very poor grade of zinc has been used in the manufacture of the brass, the aluminum causing the lead which exists as an impurity in the zinc to sweat out of the brass, which, of course, is to the detriment of the looks of the brass casting; but this is only the case with the very poor qualities of brass. Good brass made from a good quality of zinc does not contain any lead as an impurity, and, on the contrary, you get a very bright, clean surface by the use of aluminum, and if the foundrymen complain of this black color, as the action of aluminum on their brass, it is so much the worse for the brass, and they had better choose a better quality of zinc from which to make it.

In the case of small patterns, you can cast from a gate containing from one-third to one-half more patterns than you can otherwise without the use of aluminum.

Secondly, the percentages of aluminum in aluminum brass can be increased all the way up to eleven or twelve per cent., and when added in these quantities it is done to produce additional strength; even one to two per cent. in aluminum brass is particularly desirable, where a strong, tough brass, with a good surface, such, for instance, as in electrical machinery, handles of switch-boards and such apparatus that are subject to sudden and severe strains.

In regard to the manufacture of aluminum brass, the aluminum had best be added in the form of aluminized zinc, so as to be sure that the aluminum is fully distributed throughout the mass, and also introduced in such a manner as not to oxidize the aluminum. This aluminized zinc is made by taking any given quantity of aluminum, depending upon what percentage of aluminized zinc you intend to make; that generally used for the lower percentages is a five per cent. aluminized zinc, and that for the high percentages of aluminum brass, a ten per cent. aluminized zinc. Either five or ten pounds of aluminum, therefore, is placed in the bottom of a plumbago crucible, and is melted, care being taken not to raise the temperature of the aluminum any more above the melting point than is absolutely necessary—the melting point of aluminum being about 1,200 degrees Fahrenheit. The zinc is then added, until ninety-five or ninety pounds of zinc has been placed in the crucible, and the crucible is then removed from the fire and the contents cast into ingots of any convenient form.

This aluminized zinc is then added with the original zinc or spelter, and is treated in the same way as the spelter is in the manufacture of a brass mixture; the percentage of aluminized zinc used with other zinc depending on the percentage of aluminum which is required in the brass mixture.

In the manufacture of castings from aluminum bronze, one great point to be guarded against is the shrinkage in the casting itself. This point is overcome by the use of large gates and high risers, giving the metal a chance to cool in the body of the casting before the gate itself gets cold, thus allowing the molten metal in the gate to flow in and feed the shrinkage as it takes place in the body of the casting.

Another method which is applicable to castings, both in aluminum and in aluminum bronze, and for which certain patents have been taken out by L. J. Crecelious, and are controlled by the St. Louis Refrigerator & Wooden Gutter Co., of St. Louis, Mo., and is the process that they use in casting their aluminum bicycle frames, forks, handle bars, etc., is to have an iron mold made and to place this mold in a furnace, and heat it up to the temperature of the metal that is to be cast, or very nearly so, then either by removing the mold from the furnace or manipulating the mold in such a manner that the molten metal can be poured into this mold, without removing it from the furnace.

The metal is then poured into this mold, and if it has been removed from the furnace it is replaced, so as to allow the metal and the mold to come to the same temperature. Then the mold is removed from the furnace and cooled from the bottom upwards, either by lowering gradually into a cooling bath, or by turning on the mold a jet of air from a blower through the nozzle, so that by controlling the nozzle, the mold is cooled from the bottom upwards, as above stated.

In cooling this way, the metal in the mold and the mold both cool at the same time, from the bottom upwards, and the molten metal in the upper part of the mold flows down and supplies the shrinkage of metal as it cools. The shrinkage is thus brought in the gate, which does not have to be very

large in making castings in this manner.

All blowing away from the mold is prevented by heating the mold and cooling as herein described, as the metal and the mold being of the same temperature, there is no chance for the metal to blow away from the mold as it cools, as this blowing away consists simply of a shrinkage caused by the molten metal coming in contact with a cold surface, and no metal being able to flow in and feed the casting as it shrinks.

The manner of making aluminum bronze castings by those who have succeeded in getting the best results, use the following method, which is to be followed exactly, all the reasons for which cannot be given here, owing to limited space.

The copper should be put in a plumbago crucible and melted over a coke fire, this being the best fuel to use; next to coke, charcoal, and then oil. It is almost impossible to make satisfactory aluminum bronze over a hard or soft coal fire, for the reason that the copper will absorb sulphurous gases from the coal. The copper should be covered with charcoal to prevent oxidation and the absorption of gases as far as possible, as there is always a liability for a small amount of them to be present.

After the copper is melted and the time has arrived to put in the aluminum, take hold of the crucible with tongs, and put in the pot the percentage of aluminum which it is desired to add. In large pots it may even be removed from the fire before adding the aluminum. As soon as the aluminum goes into the pot, the first action will be a cooling action to a certain extent, caused by the actual temperature of the aluminum; but as the aluminum and copper form a natural alloy with each other, the aluminum as soon as it is heated to its melting temperature goes into combination with the copper, and consequently a great deal of heat is generated by this chemical union of the two metals.

If you watch your pot, you can tell as soon as this union takes place, for the reason that the copper will become more liquid and also turn a little brighter. This is only an instant after you have put in your aluminum, and then, if the crucible has remained on the fire, you should remove it from the fire instantly; the charcoal should then be skimmed from the surface, and the mix, which is now aluminum bronze, poured into molds of any convenient size, and after the aluminum bronze has become cold, remelt and pour into castings, as may be desired.

Some authorities claim that after the aluminum bronze is made it improves with each successive re-melting and casting, until this has been accomplished three or four times, for the reason that it seems to give the aluminum a better chance to become freely disseminated and form a more uniform alloy with the copper. After you put your aluminum in the crucible, and before pouring, you should stir the molten mass, in order to insure that the aluminum is well disseminated through the entire crucible. If these points are strictly adhered to, there will be no trouble in producing good castings.

The copper and aluminum used should be extremely pure; and the best results will be obtained by using the "Lake" product.

The percentage of aluminum in aluminum bronze varies from a few per cent up to ten or eleven per cent, depending for what purpose the metal is intended; the strongest mixture is about ten per cent—beyond this point it is hard to work, and becomes brittle. —Aluminum World.

"Chimmie Powers" in St. Louis.

Damfino what's goin' to become of us here in St. Louis if times keeps on dis way, dere ain't a job in town outside of the car shops, an' de House works shops, all de shops on de East Side seems to be catchin' more den dere share. Over in Granite City, where Dutch Bill's got charge, dere's plenty to do. Maher, from Springfield, is workin' dere, so is Bob Allison. Down at Madison dere's lots of work, but dat's a car shop, an' its hard to get in. Wood Davis is foreman, an' dere makin' ingot molds fur de Granite City Rollin' Mils, an' I hear since dat dey got de work fur de Tudor Iron Works. Todds is got dere share of what's goin', an' are makin' big improvements in dere foundry, such as puttin' in another crane, makin' de buildin' bigger, an' remodelin' de core oven. De Missouri Malleable Foundry over dere is de biggest foundry I ever seen; w'en yon stan' at one end you got to look twice to see de oder end, an' it looks like dere 'bout a t'ousan' stan'-up molders workin' dere, 'sides

a lot dat's on de floor. De only ones I knew was two on de floor, Billy Woodruff an' Mirt Mitchell. Mitchell mus' like it over dere, 'cause he quit a job in de custom house to take it 'bout tree years 'go. I see Henry Widman's got charge of de Union Foundry. Well, de company picked de right man den; 'less I miss my guess, dere busy dere on house work an' some machinery. I wonder what's de matter wid ole Bill Fawcett out at Dutroes. Seems like he can't keep a foreman more den a few months any more. Harry Graf trun up de spunge de first of de month, an' dey put Jack Cunningham back in de saddle agin; it all cum like dis, Jack had a racket wid Fawcett an' quit an' a little while after Harry Graf flew de coup, den when Jack come fur his money, de ole man give him charge of de shop. I was lookin' in de window dere las' week an' seen Billy Brockman, Gus Wamhoff, Rathead McGovern an' Red Jack. Tom Wright's dere too, but he wus dead rong when he let de gang on Chateau avenue make a bottleholder of him in dat little deal didn't go through las' fall. I seen Paddy Cain on de streets las' week. Paddy was travelin' in de intrest of science de las' few years, but gave it up in disgust. I wus talkin' to Sam Teal through de dog-shop window at Allen's yisterd'y, an' he sed dey had a tree-roll cain mill to build. Moxie, de kid, will graduate from Allen's academy nex' week.

Did I go de Coremakers' ball? Sure ting. Dere wus a big crowd dere too. I spent mos' of the evenin' in de saloon, where dere wus lots of fun. We could size up de crowd in de ball-room from he bar-room door. Joe Carlin wus dere wid his Mickey Healy coat an' vest on, an' he was covered over wid badges, bokas an' ribbons. Pat Dougherty wus very poplar among de ladies an' kep' sober. McIntyre wusn't so slow about swingin' dem neider. Fredy Seibenicker never got off de floor till day put de lights out an' de band went home. Capt'n Ed. Ten Broeck wus dere in time for de gran' march. He wore his pan's dancin' length, an' had on his glass front—by dat I mean his tie-pin; some of dem said it was a piece of icc. The two Kilkeneys wus dere, but dey both went to sleep early in de evenin' on a chair in de saloon. One of 'em wus all covered wid sawdust. Ole man Carlin wus shakin' han's wid everybody. Crazy Ward took care of de strong box 'hind de bar. "Snake" Kinney, de little fat coremaker, wus on de bills to sling beer, but he didn't show up. De gang in de saloon wus eatin' 'em up right. One of Timmerman's molders cum in de saloon 'bout twelve o'clock an' hollered "Git yer pardners fur a fight!" an' say, dey didn't do a ting to him. You orter hear de glass jingle when he went trough de window.

I met Joe Farris de other day, an', hully gee! you ought to see all de good close he had on. Joe sed he wusn't on Gov. Altgeld's staff of factory inspectors any more. He' an ornagizer fur a new society dey call de Court of Honor. Joe sed de foundry biz in Springfield is awful slow.

I went over to East St. Louis de odder night to hear "Debs de Great," an' say, you ought ter seen de big crowd, an' de spiel he made. Maybe you tink he ain't popular. When he got trough talkin' de people rushed on de stage, men and wimen. Dey shook his hands, hugged him, an' I wondered why dey didn't pull de clo'se off him. I seen Henry Bodeman dere after de meetin' broke up. Henry cum over wid a crowd from Belleville dat filled a special train. He sed of de ate foundries over dere dat mos' of dem wus doin' putty fair.

I took a run down to Carondelet de odder day, an' de old Vulvan is wrecked. Botts is foreman of de Sout St. Louis Foundry, an' I ast him fur a job, an' he ses, "Come 'rount to-morrow; tink I'll need a man." Den he starts askin' me where I served mi time, where I wus frum, what class o' work I wus used to workin' on, an' a hole lot o' stuff. Den I flagged him 'n ses, I'm an all-'roun molder, an' can work any place; but you kin keep your job an' I'll keep my own statistics, an' dat's no barrel house talk neider. Say, dem fellers down dere 's 'fraid to whisper der names to each oder. Wusn't I wurkin' in Granit City lately? Why, cert; I worked dere ten days; but what's de use stayin' in one shop all de time. I puts mi Trilbys under de festive board twenty-one times a week, an' I don't tink any of dem's beatin' dat, 'less it's Pete Brennan. Say, dere's a guy dats up to date. Ever hear how he dun time de dull times? Well, Squeezejaw Powers tole me dat he use to stay up all night to keep frum sleepin', an' sleep all day to keep frum eatin'. Now, mi peoples satisfied if I keep sober an' out of jail.

I seen Bill Wilson on Olive street las' week. He ain't pedlin' facin' any more. He had a little go-away bag full of patent door latches. He ses it's a bottled-up good thing, an' tinks it will put him on de shady side of Easy street in a few months.

Jack Dillon an' Birdy Leonard was discussin' de good qualities of Allen's molders one night a short time ago, an' dey both got hot under de hat, hot words passed, an' den dey clinched. In de skuffel Jack stood on his head in a spittoon, an' de nex' minute Birdy wus de under dog. Jack got up an' wus jus' goin' to give him de boot when frens got 'tween 'em. What's dat? Why, cert; gimme de same.

Philadelphia Founduymen's Association.

The regular monthly meeting of the Foundrymen's Association was held at the Manufacturers' Club in Philadelphia, on Wednesday, March 4, the president, Francis Schumann, occupying the chair.

The reading of the minutes of the last meeting having been dispensed with, Secretary Evans read the report of the executive committee, which was as follows:

"We find very little improvement in business up to this date. There is not the healthy feeling that we had anticipated at the opening of the new year. We find people are buying from hand to mouth rather than put in a stock of material which would last several months. While there are a number of foundries that are quite busy, the majority of them seem to want work to fill up their shops. With the mild weather that must come we hope there will be a decided improvement, so that the first half of the year will show a good average business. Our report is rather discouraging, but when compared with the corresponding period of last year, we think the present period shows considerably more activity and demand.

"We want to call especial attention to the fact that the proposed national convention of foundrymen will be held in Philadelphia, May 12, 13 and 14. The object of the convention is to bring the foundrymen of this country together to discuss their interests and to urge the formation of associations similar to our own in every section, to bring about a more friendly feeling than at present exists. We believe that in the end such a course would tend to more satisfactory prices and a better knowledge of the cost of production of castings. Foundrymen of the continent of Europe have been organized for a number of years, and the consequence is that to-day a better price is obtained for castings in England, France and Germany, although molders' wages are lower than in the United States. We are told of a small foundry in Scotland, employing 20 molders, whose profits for one year were $15,000. We do not know of a foundry of the same size in this country that can make nearly so good a showing. While this association does not take up the matter of price, nor expect to make the price at which castings shall be sold, we think that through the medium of frequent meetings the foundries in the different sections of the country may get more satisfactory prices than they are getting today.

"At the national convention a number of important papers will be presented on subjects of national importance, and as this will be the first general convention of foundrymen ever held in the United States, we think it cannot fail to bring about good results. We should like to have the assistance of every foundryman in the country to help us make the convention a success."

Election of new members being next in order the following were duly elected: The Columbia Foundry Company, Kavanagh & McDermott, Pettinos Bros., and the Philadelphia Sash Weight Company, all of Philadelphia.

Fred. C. Brooksbank then read a paper on "The Sand Blast Apparatus for Cleaning Castings," as follows:

The invention of the sand blast process by Gen. B. C. Tilghman, of Philadelphia, Pa., in the year 1870, marked the introduction of an entirely new process into the arts. In the 25 years that have elapsed since that time the process has been in constant use for an increasing number of purposes, and seems to be a process which is destined to retain a permanent place of its own in manufacturing operations.

The method, stated shortly, consists of projecting a stream of sand or other abrasive powder, usually dry, but sometimes mixed with water, with more or less force and velocity to strike and pulverize the surfaces

of glass, stone, metal and other materials upon which it is directed.

It has been frequently pointed out that in this invention Mr. Tilghman has really borrowed or adopted from Nature herself, inasmuch as he has intensified and put to use a natural force, of which the effects are always apparent under favoring conditions; that is to say, wherever we find large deposits of loose sand exposed to prevalent winds, by which the sand is caught up and blown against any hard substance, such, for example, as the glass in a window, which soon becomes depolished and obscured by the contact of the sand, or stone, the surface of which, with time, is sensibly roughened and sometimes scored in a manner quite distinct from ordinary weathering.

The abrasives used in the process include ordinary inland siliceous sand, sharp builders' sand, powdered glass, emery from fine to coarse, chilled iron sand and steel shot; and the steam of the powders is forcibly projected through variously formed nozzles by means of steam, by currents induced by exhaust air, by blasts of air, and latterly and more conveniently by compressed air. Sand from its plenteousness and general suitability, is mostly employed. The white beach sand of New Jersey is probably as good as can be found anywhere for general purposes.

The action of the sand blast is not cutting, not grinding, not abrading in any of the usual meaning of these terms. It is a true pulverization by the successive impact of the grains of flying sand. The sand acts much in the same manner, but on an infinitely reduced scale, as artillery projectiles in breaching a masonry wall, each independently of all the rest. In this action it differs from anything that has preceded it, and it still stands alone. It is this difference between its action and all other processes that has caused the general misunderstanding about it above referred to. As all know, the process consists simply in driving a stream of rapidly moving sand against the object to be operated upon. How the sand is given velocity or how the work is presented to the blast, are matters of indifference when examining the theory of the process. As the total action of the blast is but the summation of the action of the individual grains, the action of the individual grain is to be considered. If the single grain of the flying sand has no effect when it strikes the work, then no other grains will have any, and the sand blast will be without effect, no matter how long continued. If, however, the single grain of sand has any effect upon the object struck, then the blast will wear it away often at an extraordinary speed, as the number of grains propelled against it is very large, often as many as 5,000,000 per minute.

Grains of sand have numerous angles, and the action of these grains, as also that of the other abrasives mentioned, upon the surfaces of glass, stone or metal, is due to the circumstance that every individual grain in the infinite number in the incessant stream, urged violently forward, has all its energy instantly arrested, transferred and concentrated upon its point of impact, where it produces a minute pit or depression; and, as every grain in the shower acts alike, the abrasion resulting from the whole is perfectly uniform in depth and texture or roughness. The single question, therefore, to be considered is, does the stress at the point of impact between the grain of flying sand and the object struck rise high enough to overcome the strength of the latter?

Three factors determine this: 1. The energy in the flying grain; this belongs entirely to the strength of the blast. 2. The area upon which this energy is expended; this belongs principally to the object struck, although the shape and size of the sand of the blast have some effect upon it; and, 3, the strength of the object struck, which, of course, belongs entirely to it. Now, the energy contained in a single flying grain of sand is very small, even when traveling at a very considerable velocity, but it is the exceedingly small area upon which this is expended that makes any cutting by it possible. As an illustration of the above points, take, for instance, the case of a sand blast using sand of an average of 50-inch in diameter and propelled by steam of 50 pounds to the square inch, cutting granite. Such a blast, under these circumstances, will cut granite rapidly. Why? Determining the above factors, first, such sand grains will weigh on an average about 0.005 grain, and will be moving at the point of impact with the stone about 400 feet per second, and will, therefore, contain about 0.00176 foot pound energy. Now, this is certainly a very small

amount, but next, take the area upon which it is expended.

The area of first impact can only be estimated from the following considerations: If a piece of smooth, hard substance is scratched with the edge of crystal, as, for instance, in ruling diffraction gratings and that class of work, lines are readily ruled at the rate of 12,000 to the inch, and when examined under the microscope the lines are seen to be narrow in comparison to the space separating them, being themselves probably not more than 50-1000-inch broad, and it is upon a rectangle of the length of side equal to the breadth of one of these lines that the first impact occurs. This is 0.000,000,000,4 square inch. And the above determined 0.00176 foot pound of energy distributed upon this area is at the rate of 440,000 foot pounds per square inch. Now, the strongest granite can only stand a quiet crushing strain of some 1,200 tons per square foot, or at the rate of some 16,600 pounds to the square inch. The contest between the stress developed at the point of impact or the resistance of the object struck is in this case decided overwhelmingly in favor of the stress developed. The result is that the granite under the point of the first impact is crushed and crumbled to dust, letting the grain of sand progress until in its advance it has expended its energy and increased the area of contact until the pressure there falls below the crushing strength of the granite, and then the action of that grain is over and it rebounds from the stone. The striking edge or point of the grain of sand is also crushed and contributes to increasing the area of contact between it and the granite. The effect of the above sand blast when striking a piece of wrought iron in place of the granite will be that the iron instead of being pulverized like the granite is only indented. The result is that no metal is removed, but a small indentation produced. Other grains striking in the immediate vicinity of this indentation simply shove the metal back into it again and obliterate the effect of the first grain. Thus no effect is produced, but the surface is simply roughened by the indentations of the sand grains. This is the normal effect of the blast upon all metals. If they are exposed for a long time to the action of the sand, as in a sand blast machine, metals wear away, because the surface metal is exhausted by the constant bending so that it at last breaks. If the blast is directed upon a piece of soft rubber the same action as in the case of the metal takes place, but in this case the elasticity of the rubber is such as to enable it to resume its original shape after the force of the impact has been expended in deforming it, and there is no residual effect whatever upon the rubber, the grain of sand rebounding with almost its original velocity. These three actions and the combinations of them explain all the different effects of the sand blast, in cutting and refusing to cut various substances.

In surface obscuring or ornamenting, such as in glass work, for which the sand blast has been more used than for all other purposes combined, the problem is entirely different. The effect wanted is to break the continuity of the surface struck, and this once obtained, any further force in the blow of the sand is wasted, and an exceedingly great number of light blows is what is desired. Therefore a very fine sand is used and a large quantity thrown in proportion to the propelling jet, which gives a moderate velocity. So important is this adaptation of the size of sand to the work that if two exactly similar machines are taken, one using fine and the other coarse sand, and both using the same pressure of either air or steam to drive the sand and the same size jet, the machine using fine sand will obscure three times the work that the machine using coarse will do. But in cutting or perforating glass or stone the machine using coarse sand will do three times the work of the machine using fine sand. In one case the blows are too few to break up much surface and in the other case they are too light to do much cutting. Thus, by use of sand unsuited to the work, the efficiency of a good machine can be reduced over 60 per cent.

The earliest forms of apparatus perfected was the high pressure steam jet described in the patent of 1870. In this form of apparatus a small jet of high pressure steam of an annular shape escapes into a larger tube and along with it a current of air through a central tube, which is surrounded by the annular steam jet. This inspirated current of air carries with it a large portion of sand and becomes mixed with the escaping steam and is thrown directly against the work at a high velocity. The nozzle tube is made of hard

white iron and so constructed as to be cheaply and easily replaceable. This form of jet for hard, heavy cutting is as efficient in output of work in proportion to power used as anything that has been constructed since. Its other disadvantages, however, have caused it to be abandoned in favor of other devices of more modern construction. Among these were chiefly the wetting of the sand each time it was used; clogging of the sand feed pipe if this drying was imperfectly done; enveloping the work in a cloud of steam so that the progress of the work could not be followed by the operator; cracking of glass articles by the sudden and unequal application of heat to them, and rusting all articles of iron or steel, subsequent to the cleaning by wetting them with hot water from the condensed steam. The use of compressed air avoids all these disadvantageous qualities. In spite of all these disadvantages, however, this system was used for a long time to a considerable extent in the stone trade, among other things, doing the marking of over 100,000 tombstones in the national cemeteries, cutting down the whole face of the stone and leaving the inscription in raised letters about one-quarter inch high.

For cleaning metals, however, these disadvantages have totally prevented the use of the steam jet. Compressed air was tried in the same form of jet. Although it did good work, it did not succeed practically or commercially on account of the great expense of providing a sufficient supply of compresed air at the pressures required. The small amount of work that a jet of compressed air used in one of these old induction feed steam jets would do was remarkable, and most discouraging in comparison with what a jet of steam would do under the same pressure. The whole class of induction feed jets would not work reliably at the lower and more economical air pressures. They, however, would work well, cost not considered, and completely obviated the faults just referred to of the steam jet.

In a recently designed machine these points have been retained and there has been secured also the full efficiency of the blast, due to the pressure at which it is used, unreduced by the admixture of any dead air carrying the sand with it, at just the place where the maximum velocity is desired. This machine uses air at all pressures, but those about 10 pounds to the square inch are found to be the most satisfactory. By immersing the whole sand supply in an atmosphere of air at the above pressure, contained in a tight reservoir, the advantages of a purely gravity feed are obtained, uncomplicated by any questions of difference of pressure inside of the jet tubes and without. Then, by the use of a flexible tube of considerable diameter, the sand and air, in a mixed current, are carried to a point where they are to be used. Here the flexible tube is terminated by a hard chilled iron cone, terminating in a tube of small diameter. In traversing this latter portion of its course the mixed current of sand and air increases its velocity inversely as the square of the diameter of the tube, and is finally discharged from the end of the blast nozzle at the full velocity due to the pressure behind it. An air lock arrangement for transferring new supplies of sand into the sand reservoir, while still under pressure, and valves for operating and graduating air and sand supply, with a suitable compressor for furnishing the supply of compressed air, complete the arrangement. This machine is comparatively new in this country, but has been used to a considerable extent in England and the continent for cleaning off scale from sheet metal and castings and forgings. The machines are built in different sizes, and, of course, their output of work depends strictly upon the amount of compressed air that they use per minute. A machine using 60 cubic feet of air per minute requires 3 indicated horse-power to run the compressor, which furnishes this amount of air compressed to a pressure of 10 pounds to the square inch.

At this volume and pressure the work accomplished on ordinary rolled steel plates is 1 square foot of scale removed per minute. Iron plate usually has thicker scale and requires slightly longer time. Forgings and castings differ so much in the nature of their scale, both from kind and heat of iron, kind of molding sand and several other particulars, that it is impossible to give any general rate which will be sure to suit more than the individual case which is considered. Trial is the only safe criterion.

USES OF THE SAND BLAST.

The recent improvements and inventions of Mr. Mathewson, manager of the Tilghman Sand Blast Company, Sheffield, England,

have given a new impetus to the use of sand blast for a great variety of purposes. In metal it is used for the removal of the hard scale, so destructive to cutting tools, from castings and forgings. Among the applications are the removal of the scale from sheet iron and steel prior to enameling, galvanizing, nickeling, tinning, etc.; the cleaning of tubes and brazed joints, largely used in bicycle work; sharpening the teeth of files; for granulating or frosting electroplate, gilding metal, gold and silversmiths' work and jewelry; the reduction to clean metal surfaces of larger works, ranging from steel forgings of safes to armor plates; on stone, slate and granite, for incised carving and inscriptions in intaglio or relief; for cleaning off the grime from stone, granite and brick buildings, and in contrast to this last, for the most delicate drawing for lithography.

Among other purposes it is employed for removing fur and deposits in tubes and tanks; for cleaning off accumulations of paint and dirt within iron ships; for roughening the surfaces of metal rollers; for decorating coat and other buttons; for granulating glass to give it a key for ornamental painting by hand; for piercing the apertures in glass ventilators; for marking cakes of glue and cement; for marking pottery and in the manufacture of ornamental tiles; for smooth facing bricks to receive white glass or enamel; for refacing grindstones, emery and corundum wheels; for granulating celluloid films for photography, and on wood to bring out the grain in relief, and latterly, for blocks for printing.

Another recent improvement in connection with the use of sand blast is the application of it in connection with tumbling barrels. These barrels run very slowly (two or three revolutions per minute), consequently there is little risk of breaking fragile castings; neither are the edges of them worn off and destroyed, as in the case of ordinary rattling at high speed. The castings are not cleaned by tumbling, but by sand blast inserted at one or both ends of the barrel. The usual time consumed in cleaning a charge of this barrel is from 20 to 30 minutes. The latest design of this machine is arranged at an elevation directly over the sand blast apparatus, which has two flexible tubes and nozzles. These are inserted into each end of the barrel, which is inclosed and provided with an exhaust fan to carry off the dust. The barrel is perforated with small holes, through which the sand falls through a hopper and directly back into the sand blast apparatus, thus making it almost entirely automatic.

CLEANING IRON WORK BEFORE PAINTING.

There is another application of the sand blast which is just beginning to attract the attention that it deserves. This is in the preparaton of metal work of all kinds for painting as a protection against corrosion of all kinds, principally, of course, in protecting iron work against the weather. For this purpose the one necessary condition is to get a close contact between the metallic iron and the oil of the paint. If this is secured the paint will last and stick on in a manner entirely unknown in the present ordinary commercial painting of iron structures. If this absolute contact of paint and metal is not secured and the thinnest coat of oxide, either rust or scale, intervenes, the painting is in a great measure useless. The paint not reaching the iron cannot stick to it, it can only stick to the coat of oxide which it can reach, and as a result when the coat of oxide loses its hold on the iron and props, the paint comes with it.

The difference between what can and should be done in the way of protection of iron by paint and what usually is done is shown in the case of ship plates, when, as is sometimes found, the numbers and marks painted on the plates in the rolling mill when the sheets are perfectly clean, just from the rolls, are found of the full original thickness of the plates, while the rest, painted in the ordinary way, is so much corroded as to render it necessary to replace the plate. This degree of protection is what should always be obtained and which can best be obtained if iron is thoroughly cleaned by sand blast immediately before it is painted. And we will venture to predict that it will not be a long time before the specifications of structural iron work to be protected by paint will usually call for a thorough sand blast cleaning immediately before painting.

Another use for which we predict a large demand for sand blast work is in boiler making. At present the sheets covered with oxide are placed together and riveted up.

The blows of the riveting thoroughly pulverize the scale on the plates where they lap on each rivet, leaving a thin layer of powdered scale between the plates, through the interstices of which steam and water under pressure will find their way. To prevent this the excessive calking now used is necessary. If the sheets were clean metal to metal, without foreign substances between them at the joint, much of the present calking would be unnecessary. This would leave the full strength of the rivets and plates to withstand the internal pressure instead of having a large portion of their strength taken up in withstanding the initial strains produced by calking.

The ordinary method of attempting to produce a clean metallic surface on castings, forgings, etc., for these and other purposes is by pickling. This process, apart from its numerous well-known disadvantages, which make all who have anything to do with it wish to replace it with some other process, has a serious effect upon the internal structure of the iron, as the following reports of experimental results will show:

THE EFFECT OF PICKLING IRON AND STEEL.

The effect of pickling and rusting on the strength of iron and steel has been shown by A. Ledebur, of Berlin. Rails, joints and bars were subjected to various conditions: 1. In the condition as delivered. 2. After exposure for purpose of rusting. 3. Galvanized and tested at once. 4. Galvanized and exposed for a time. 5. Pickled in acid and immediately tested. 6. Pickled and kept for a time in a dry place. The pickling was done with sulphuric acid diluted with water in the proportion of 1-100. The samples were tested for transverse, tensile and compressive strains and under a falling weight, these experiments being made on the same sample for each of the six conditions. The bending tests with wrought iron joists showed substantially the same for all the conditons; the maximum loads carried showed differences, being highest in the natural condition and lowest when freshly pickled. Rusting also produces a diminution of strength more apparent in the galvanized specimens than in those not galvanized.. In the instances where the specimens were broken the diminution in strength is said to be very decided in the pickled and perceptible in the rusted specimens. The figures are: Breaking strain under condition 1, 35 tons; under condition 2, 33.9 tons; under condition 4, 32.7 tons; under condition 5, 29.6 tons, and under condition 6, 30 tons. The steel specimens showed results which follow the same law.

When iron is placed in acid some of it is dissolved and hydrogen liberated. This gas is supposed to be of the nature of metal, and as such it combines with and forms an alloy with the iron, which becomes quite brittle till the iron is heated and the hydrogen is liberated, when it regains its tenacity. If a piece of wire be broken when it has thus become alloyed with hydrogen, and the end wetted, the bubbles of gas may be seen rapidly passing through the water. This condition of things was observed and investigated by W. Johnson, of Manchester, and afterward by Prof. Osborne Reynolds. The latter showed that if an iron tube be closed at one end and filled with oil and placed in an acid solution, hyrodgen is liberated from the outside, which passes through the wall of the tube, displacing the oil, so that the gas may thus be easily collected from the inside of the tube. There is a possibility, therefore, that when iron is rusting the hyrodgen liberated may similarly combine with the iron and render it brittle or reduce its strength, and this is a question of much importance to engineers.

PICKLING HAS DISADVANTAGES.

Some interesting experiments in regard to the decrease in the strength of iron after being pickled and galvanized were recently reported in Tin and Terne. A dozen eye bolts, all precisely alike so far as could be perceived by external inspection, were carefully selected. Six of these eye bolts were laid to one side and the others sent away to be galvanized. A testing machine was not at hand, but six bolts were connected together, one being connected to each of the ungalvanized ones. They were placed between two pieces of iron and the nuts screwed up until the eye bolts broke. Invariably it was found that the galvanized eye bolts were the ones to break; not in one instance did the ungalvanized ones give away. Boat builders also state that galvanized iron is "rotten." They say that when great strength is required select the iron and have the fittings forged

by a good smith, but do not have them galvanized. Galvanized iron is frequently used in places where little strength is required, but where rust would be objectionable. For this purpose galvanized iron leaves nothing to be desired, but where the full strength of the material is desired and rust stains are objectionable, the object may be obtained by cleaning them with the sand blast process and afterward coating them by the cold galvanizing process, both of which methods are becoming well known and largely used for the above purposes.

The foregoing may be of more or less interest to you, but I take it that what more nearly concerns you, and which you may ask: "Does sand blast pay for foundry use?" I say yes. But as I said before, it is difficult to approximate on general work. I am safe in saying, however, that on ordinary iron, steel, brass and bronze castings that one man operating a sand blast apparatus consuming 120 cubic feet of air per minute will clean more surface and remove more cores in a given time than is possible for from six to ten men to do with hammers, chisels and brushes. And the finished work left by the sand blast is infinitely better than what can possibly be done by hand laborers. I have proved this repeatedly. I have never yet seen the burnt sand or scale that sand blast would not remove rapidly. Not only is it a great saving in time and labor in the actual cost of castings, but a further saving is made in castings to be machined. The removal of the oxide in itself is a great saving on tools, and in many cases the tools can be run at an increased speed. This particularly applies to milling cutters.

Difficult and intricate cores are readily removed and have greatly astonished some of our well-known engineers. One peculiar thing in cleaning steel castings in which large quantities of iron nails are used is the cores. When subjected to the sand blast the sand is eaten away first and subsequently the nails will fall to the ground, sand blasted, perfectly clean and in condition to be used over again. I could give you many instances that have come under my notice of the quick removal of cores, and will mention one that was accomplished in five minutes. This was considered to be a job of from three to four hours for one man with a hammer and chisel. Quite a number of people who have adopted the sand blast recently and who previously used facings, have discontinued the use of such, and have assured me that the sand blast has enabled them to reduce the cost of their product. In conclusion I would say that the only objection to sand blast that can be found to its use in foundries is that it has an unpleasant trick of showing up defects and making them plainly discernible.

Mr. Brooksbank exhibited several specimens showing the cleaning power of the apparatus.

The paper was listened to with considerable interest, and the points brought out in the paper were substantiated by several present who had the apparatus in use.

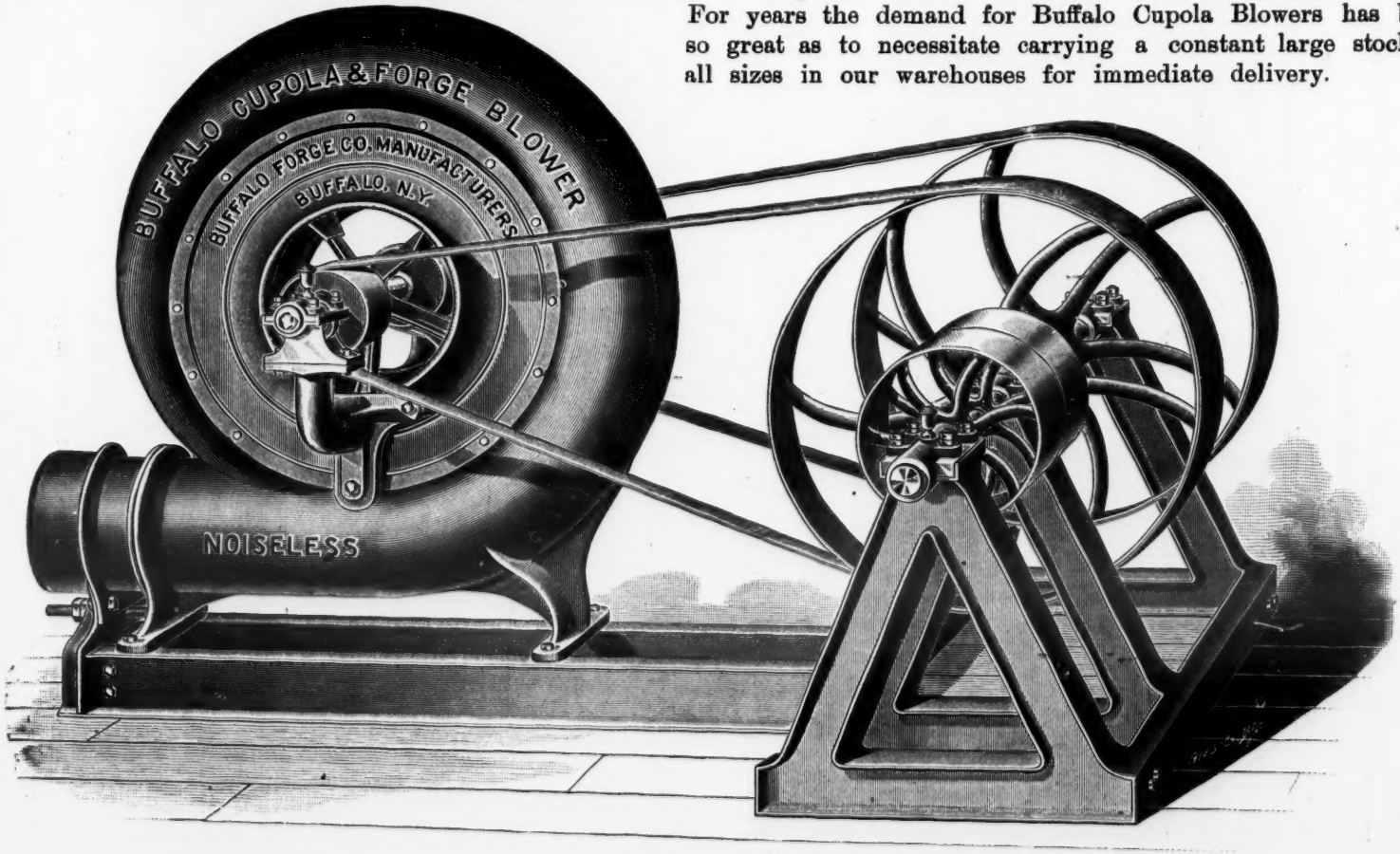
A. E. Outerbridge remarked that the paper was most interesting to him, and he could indorse its statements. He had experimented, he said, somewhat, with the view of getting information in regard to the effect the process of pickling had upon cast iron. He had found by actual tests that if bars of iron, hard or soft, were cast, and one were immersed in the ordinary pickling tub to take the sand off, and afterward subjected to a test of a transverse testing machine until breakage resulted, it would form an interesting comparison with the companion bar poured from the same ladle, taken from the same mold, and broken in the same manner. The pickled bar would be found invariably to have decreased in strength, the average decrease being about 10 per cent. In addition to this there would be found, as stated, a loss of weight caused by the dissolution of the iron.

The Carterville Foundry & Machine Co., at Carterville, Mo., suffered from a $8,000 fire February 9. Afterwards Mr. W. A. Bryant bought the interest of his partner, and is now sole owner, and is rebuilding and putting in the best machinery.

The Demorest Mfg. Co., of Williamsport, Pa., who manufacture the well-known sewing machine of that name, maintain a base ball team and brass band at their works, both of which have considerable reputation throughout that section of the country. Those who are members of both bodies are employed at the works, and it is said that the base ball team are the champions of Central Pennsylvania.

The Latest Developments in Foundry Blower Construction is fully detailed in the 1896 catalogue of the Buffalo Forge Company, Buffalo, N. Y., U. S. A. You are, perhaps, remodeling or building a new plant. Much data of unusual interest is contained therein. Its value needs no emphasis to those who have reviewed previous issues.

For years the demand for Buffalo Cupola Blowers has been so great as to necessitate carrying a constant large stock of all sizes in our warehouses for immediate delivery.

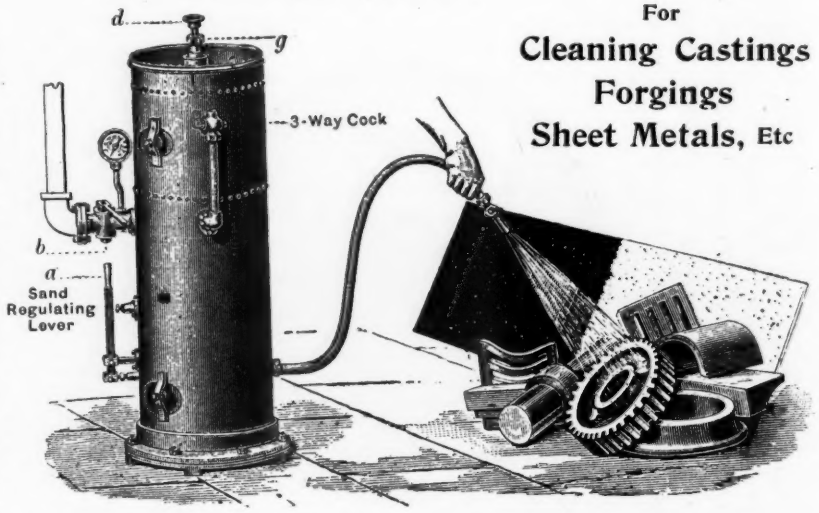


Improved Sand Blast Apparatus.

MATHEWSON'S PATENT.

By the use of common, sharp, dry sand, and with compressed air at from 10 to 15 lbs. pressure per square inch to propel the sand this Apparatus will **CLEAN** all forms of castings **more thoroughly** than is possible by hand, **for half the total cost**, and in a space of time that cannot be conceived until the machinery has been seen in actual operation.

For small castings a Special Tumbling Barrel is worked in connection with the Sand Blast Apparatus. The Air Compressor and Air Tanks used in connection with this Apparatus are especially designed to supply, most economically and satisfactorily, the requisite amount of free air at the required pressure. For further particulars, apply to



For
Cleaning Castings
Forgings
Sheet Metals, Etc

WARD & NASH, AGENTS, 33 PURCHASE ST., BOSTON
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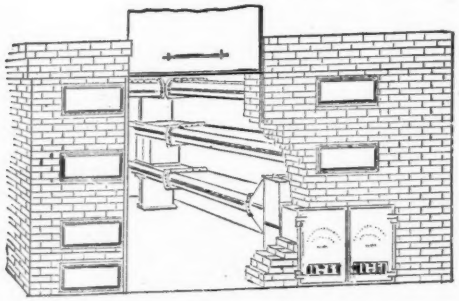
BROWN & SHARPE MFG. CO.

PROVIDENCE, R. I.

CASTINGS FOR CORE OVENS



The cut shows the general arrangement of a core oven that is economical and convenient to use, and that has been in successful use in our foundry for several years.

The distinctive feature of this core oven is an enclosed fire box, or stove, connected with the chimney by a series of cast iron flues of rectangular section. These flues run inside the oven, back and forth, in several tiers along the sides and across the end, evenly distributing the heat and keeping the oven free from ashes, smoke and gases.

The flues form shelves suitable for drying cores and their arrangement leaves the body of the oven free to receive a car or truck upon which shelves can be plaeed, making the oven suitable for large or small work.

The stoves are designed for the economical combustion of coal and can be placed to open on the right or left of door or on either side of the oven.

The patterns for the flues are so made that they can be adapted to various forms and sizes of ovens.

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ANYTHING, from a Toy Pistol to a Steel Plant.
Largest Pattern Works in the World.

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Used by the Principal Foundries in the U. S.

Prepared ready for use in **LIQUID FORM** to be mixed with the regular core sand. The cores are **DAMP-PROOF** and do not absorb moisture. **SPUTTERING** and **BLOWING** by reason of damp cores are avoided. The cores are **HARDER, FIRMER** and **STRONGER** than can be made by any other process and cost less to make. They can be set at any time and **EASILY CLEANED FROM THE CASTING.** Send for our descriptive pamphlet with prices and directions for use.

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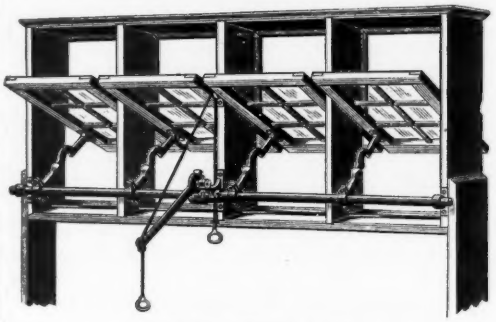

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Simple, always in order and always Locked, whether open or closed; no slamming.

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Alphabetical Index to Advertisers

	PAGE
Addyston Pipe & Steel Co	35
American Glutrose Works	34
Berlin Iron Bridge Co	7
Boutelle, R. W	29
Brown & Sharpe Mfg. Co	24
Brooklyn Fire Brick Works	36
Buffalo Forge Co	23
Buffalo Wire Brush Works	32
Canton Fillet Co	31
Chicago Flexible Shaft Co	37
Cleveland Chaplet Mfg. Co	29
Clinton Iron & Steel Co	33
Connersville Blower Co	Back Cover
Cowles Electric Smelting and Aluminum Co	Inside Cover
Craig Ridgway & Sons	15
Diamond Machine Co	37
Diamond Snap Flask	34
Devlin, Thos. & Co	26
Dixon Crucible Co., Jos	39
Fay Egan Co, The J	36
Foundry Outfitting Co	21
Garden City Fan Co	33
Garden City Sand Co	40
Gobeille Pattern Co., The	26
Goodrich, F. A. & Co	17
Gould & Eberhardt	29
Green, C. H. & Co	36
Kilbourne & Jacobs Mfg. Co	28
Keep, W. J.	30
Kelly & Co., T. P	3
Lansing Wheelbarrow Co	30
Millett Core Oven Co	36
Milwaukee Foundry Supply Co	31
McCullough-Dalzell Co	4
Obermayer Co., The S	1
Paxson & Co., J. W	2
Phœnix Iron Works Co	16
Roots Company, P. H. & F. M.	Colored Insert
Sellers, Wm. & Co	19
Shaw Crane Co	20
Smith Foundry Supply Co., The J. D.	Cover
Springfield Facing Co	31
Stewart, W. H	26
Stover Mfg. Co	28
Sturtevant & Co. B. F	10
Stow Flexible Shaft Co	32
Tabor Mfg. Co	9
Taylor, Robt. J	6
Tompkins, Vreeland	33
U. S. Graphite Co	39
Ward & Nash	24
Washington Coal and Coke Co	5
Whiting Foundry Equipment Co	22
Wrought Iron Bridge Co	8
Wilbraham Baker Blower Co	11

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The publishers of THE FOUNDRY appreciate the fact that it is customary for publications, especially the class known as Trade Journals, to quote a rate for advertising from which greater or less discounts are given, according to the persistency of the advertiser. This system is manifestly unfair as tending to show partiality. We have deducted the usual discount before quoting rates, thus giving it to all alike, and no reduction of any sort on the abov rates can be made.

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"Columbus" Steel Tubular Wheelbarrow.

Made throughout of the best quality of high grade steel. Tray stamped without joint, seam or rivet, with edge bound over steel rod. Handles, Legs and Wheels the strongest put upon Tubular Barrows.

Made in nine different sizes. Largest manufacturers in the United States of **TUBULAR BARROWS, STEEL CHARGING BARROWS and WOODEN BARROWS** of every variety. Write for catalogue to

The Kilbourne & Jacobs Manufacturing Co.

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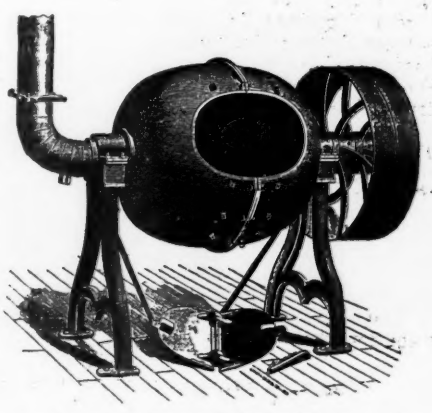
EXHAUST TUMBLING BARREL



The Stover Egg Shaped Barrel does double the work of any other with less noise and power. It gives the contents a double motion or action—from ends to center and from side to center—causing a thorough mixing and rubbing together of all the parts contained therein, cleaning and polishing the contents better and quicker than any other form of barrel.

Sent on 30 days approval to any responsible manufacturer of light castings, malleable iron wire nails, or any other small articles that require cleaning and polishing.

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205 RIVER STREET,

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DO YOU MAKE YOURS?

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HENRY HANSEN

In his paper read before the September meeting of the Western Foundrymen's Association said: "The ordinary chaplets for which almost every foundry used to rely on the blacksmith nearest at hand, which has probably been the cause of more castings being discarded and patched up than any other thing of their size are now being made by special methods and presented in a far superior condition, besides being placed on the market at a price that would not keep a blacksmith in tobacco, at the same time there are many foundries that still insist on making their own inferior Chaplets."

JOHN PETTIGREW

Superintendent of the Illinois Steel Company's foundry, at Joliet, Ills. said at the same meeting on this subject: "It is only about six months ago that I first bought factory made chaplets. We were making our own chaplets and lost a great many castings from their not being properly made. After we had bought the first lot for, I think, 60 cents a hundred, I commenced to figure up the list of those we had made and found it had been at least $2.50 and besides were not as good an article."

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Cleveland Chaplet & Mfg. Co.

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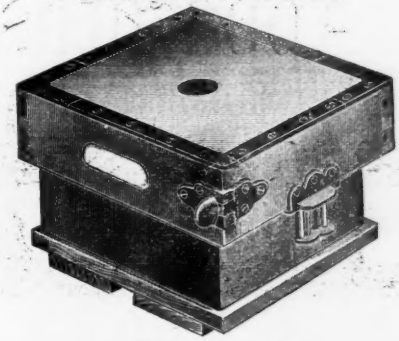
FOR HEAVY WORK.



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NO STRAINING OF WORK.

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Eberhardt's Patented Sprue or Gate Cutter

WILL STAND 50 YEARS OF WORK

Price Low

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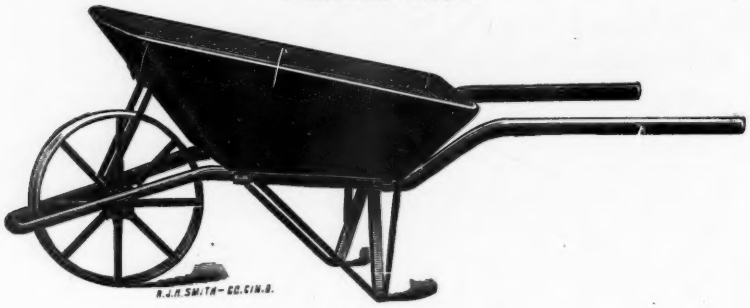
TUBULAR STEEL TRAY BARROWS

PAINTED BLUE



Style A 2 to A 8. Fig. 253.

The trays of these barrows are made of one piece of steel, of the same thickness throughout. The expense of repairing wooden barrows is greater than the original cost, and the loss of time so increases the expense that the steel barrow is cheaper in the end.

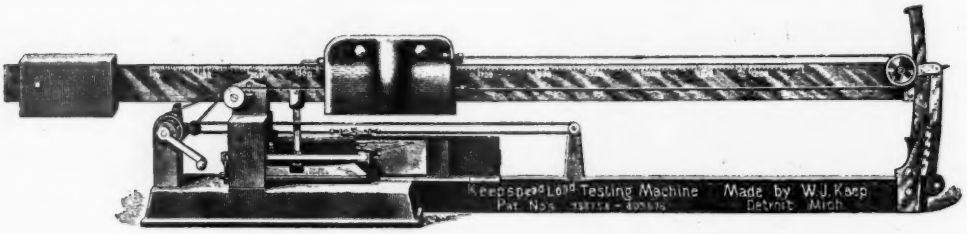
These barrows are made to dump forward, and are so constructed that at the dumping point they will not run back on the operator.

The wheels are made with gray iron hubs, with round iron spokes shouldered at tire, passing through and riveted on outside. It is impossible for the spokes to become loosened from either tire or hub. Tires are 1¾ inch wide. Wheels revolve on ⅝ inch bolt through hub.

We make all styles of Warehouse Trucks and Wood and Steel Barrows. Write for Circulars.

LANSING WHEEL BARROW CO. LANSING, MICH.

"Keep's Test" Apparatus.



By its Use
You can Produce
The Best Quality
Of Cast Iron from
The Cheapest Pig Iron.

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2 Sets Bronze Patterns with Followboard.
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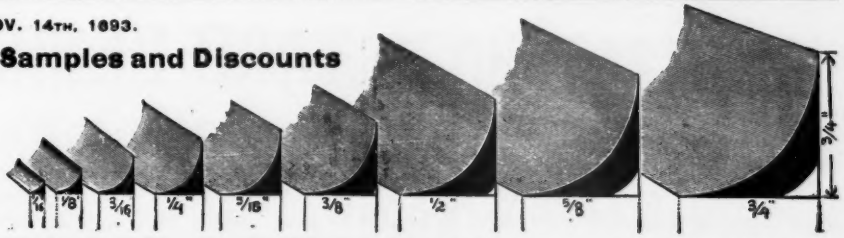

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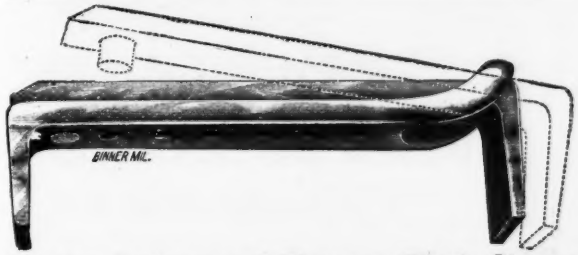
Should use none but the **BELDING PATENT LEATHER FILLET**, the only one made scientifically correct. Quickly applied to any corner, straight surface, single or compound curves, wood or iron, without nails or clamps. Once used, always used. Send sample order. **Proper Discounts will be Allowed You.**

THE CANTON FILLET CO. Canton, Ohio.



THIS is our **ADJUSTABLE CLAMP.** The Most Convenient thing possible in any foundry. We also manufacture a large line of Rapping Plates, Lifting Screws, Etc.

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COMPRISING THE

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CAR LOTS DELIVERED TO ALL PARTS OF THE U.S.

OUR CHARCOAL FACING FOR

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IT WILL PAY YOU TO KNOW ABOUT IT.

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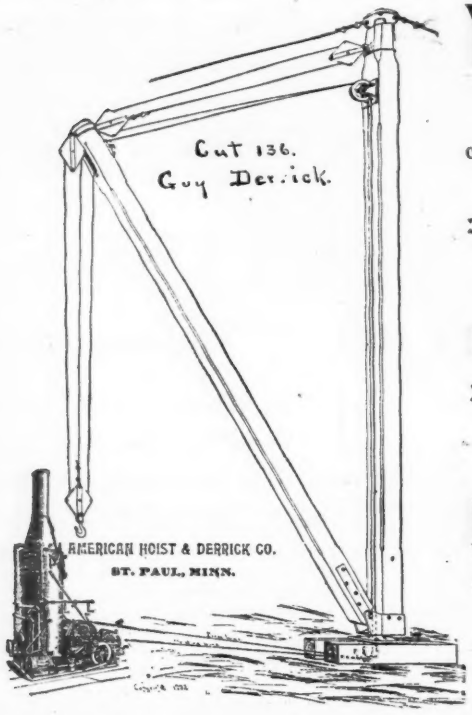

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PORTABLE
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This tool is almost indispensible for cleaning and grinding heavy castings, buffing and polishing all metals and glass. It runs Emery Wheels, either flat or on edge.

Hundreds in use giving perfect satisfaction.

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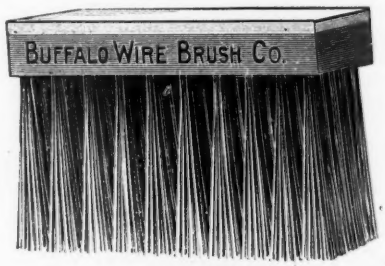

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TOMPKINS' "SMOOTH-ON CASTINGS"

IRON COMPOUND

Will stop a hole steam tight or Repair a defect in Castings and often save 100 times its cost in time and money in repairing defects in Cast Iron Patterns or other Castings . . . . . .

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Clinton Iron & Steel Co.

"FAIR DEALING" Their Motto.

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INSPECTED FOUNDRY IRONS . . . . .

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Sole Factors for DUNBAR STRONG IRON

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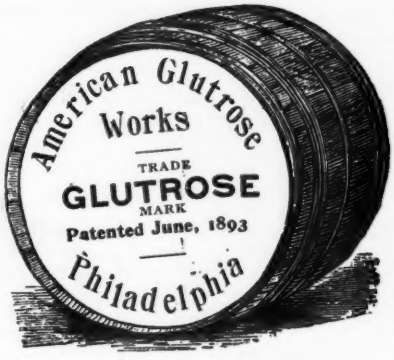

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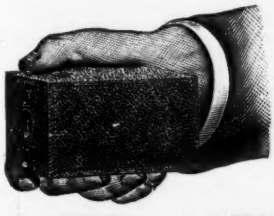

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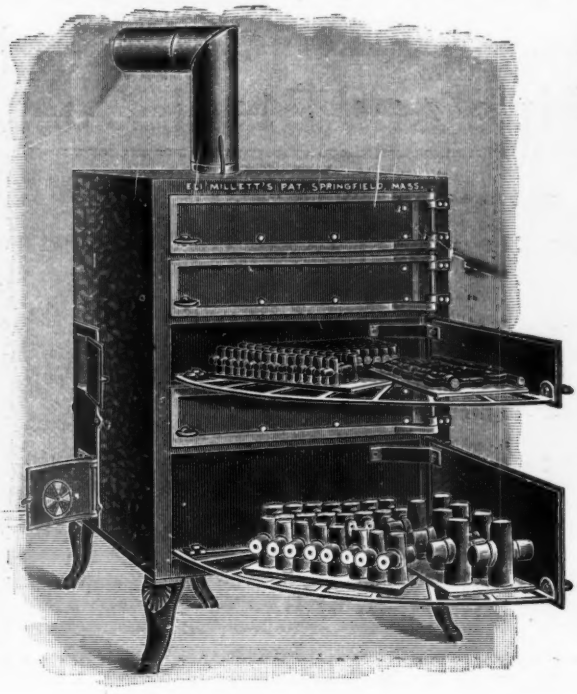

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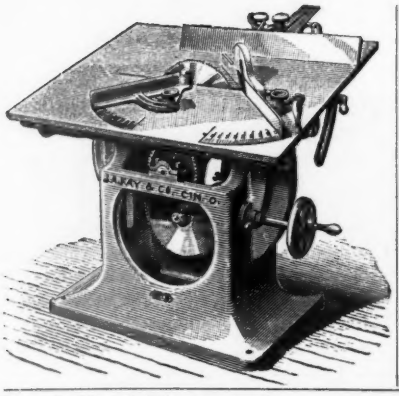

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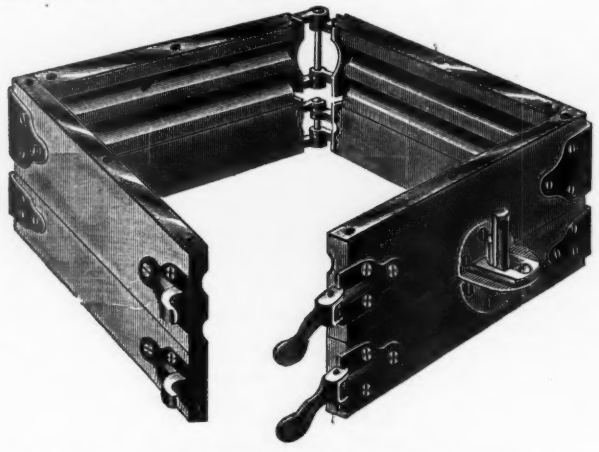

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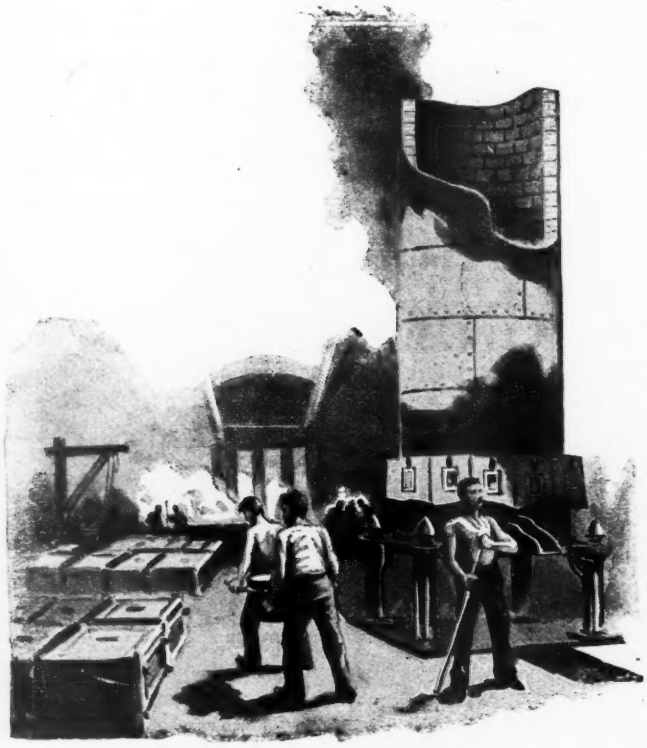

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